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A
DICTIONARY
OF
PRACTICAL MEDICINE.

VOL. III.—PART II.

LONDON
PRINTED BY SPOTTISWOODE AND CO.
NEW-STREET SQUARE

A

DICTIONARY
OF
PRACTICAL MEDICINE.

COMPRISING

GENERAL PATHOLOGY,

THE NATURE AND TREATMENT OF DISEASES,

MORBID STRUCTURES,

AND

THE DISORDERS ESPECIALLY INCIDENTAL TO CLIMATES, TO THE SEX,
AND TO THE DIFFERENT EPOCHS OF LIFE.

WITH NUMEROUS

PRESCRIPTIONS FOR THE MEDICINES RECOMMENDED;

A CLASSIFICATION OF DISEASES ACCORDING TO PATHOLOGICAL PRINCIPLES;

A COPIOUS BIBLIOGRAPHY, WITH REFERENCES;

AND

AN APPENDIX OF APPROVED FORMULÆ.

THE WHOLE FORMING A LIBRARY OF PATHOLOGY AND PRACTICAL MEDICINE AND
A DIGEST OF MEDICAL LITERATURE.

BY JAMES COPLAND, M.D., F.R.S.

FELLOW OF THE ROYAL COLLEGE OF PHYSICIANS;
HONORARY MEMBER OF THE ROYAL ACADEMY OF SCIENCES OF SWEDEN;
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AND SENIOR PHYSICIAN TO THE SOUTH LONDON DISPENSARY;
CONSULTING, AND LATELY SENIOR, PHYSICIAN TO THE ROYAL INFIRMARY
FOR DISEASES OF CHILDREN; ETC.

"Gladly wolde he lerne and gladly teche."—CHAUCER.

IN THREE VOLUMES.

VOL. III.—PART II.

LONDON
LONGMAN, BROWN, GREEN, LONGMANS, & ROBERTS.
1858

151 a. 306.

"Read, and fear not thine own understanding; this book will create a clear one in thee; and when thou hast considered thy purchase, thou wilt call the price of it a charity to thyself."

SHIRLEY.

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THOMAS ADAMS.

"Where there is much desire to learn, there will of necessity be much arguing, much writing, many opinions,— for opinions in good men are but knowledge in the making."

MILTON.

"Uti ratio sine experimentis mendax, ita experientia sine ratione fallax."

BRUNNER.

"Antequam de remediis statuatur, primum constare oportet, quis morbus et quæ morbi causa; alioquin inutilis opera inutile omne consilium."

BAGLIVI.

"It is the great excellence of a writer to put into his book as much as his book will hold."

S. JOHNSON.

"What dire necessities on every hand
Our art, our strength, our fortitude require!
Of foes intestine what a numerous band
Against this little throb of life conspire!
Yet Science can elude their fatal ire
Awhile, and turn aside Death's level'd dart,
Soothe the sharp pang, allay the fever's fire,
And brace the nerves once more, and cheer the heart,
And yet a few soft nights and balmy days impart."

BEATTIE.

"Go, little book, from this my solitude;
I cast thee on the waters,—go thy ways;
And if, as I believe, thy vein be good,
The world will find thee after many days."

SOUTHEY.

BIBLIOTHECA BODLEIANA

A
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VOL. III. PART II.

SCURVY. — SYNON.: *Scorbutus*, Sauvages, Vogel, Cullen, &c.: *Scorbutus Nauticus*, Young; — *Porphyra Nautica*, Good; — *Scharbock*, *Skorbut*, Germ.; *Skiorbug*, Dan.; — *Scorbut*, Fr.; — *Scorbuto*, Ital.; — *Scorb*, *Scarbock*, *Skörbut*, *Scorbie*, &c., Saxon, — hence *Scorbutus*, *Scurvy*.

CLASSIF. — *4th Class.* Cachectic Diseases; — *3rd Order.* Impetiginous affections (Cullen); — *3rd Class.* Sanguineous Diseases; — *4th Order.* Cachexies (*Good*). CLASS. IV. ORDER IV. (*Author in Preface*).

1. DEFIN. — *Lassitude, Debility, lowness of spirits, fœtor of the breath and sponginess of the gums, followed by livid sub-cutaneous patches and spots, especially on the lower extremities and roots of the hair, and lastly, by spontaneous hæmorrhages from mucous canals, by contractions and pains of the limbs, and superficial ulcers, &c., the disease proceeding from an alteration of the blood, caused by unwholesome or insufficient food, and by the privation of fresh vegetables and fruit.*

There are few diseases which have excited, or which deserve greater attention than scurvy, not only from medical men, but also from civil authorities and military and naval commanders. The very great prevalence and fatality of the disease during the 15th, the 16th, the 17th, and the 18th centuries, in many communities, in armies, and in fleets, &c.; the causes, both of the prevalence and of the mortality of it, being fully ascertained; the prevention and the counteraction of these causes often being in a great measure in our power; and the treatment in a very large proportion of cases admitting, especially when the causes are removed, of a successful issue, are circumstances which impart both a social and a medical interest to this disease. If we refer to its remarkable prevalence in former times, to the mortality produced by it, to the nature of the causes of its diffusion and severity, it may be justly considered one of the most distressing and fatal pestilences to which the human species is liable.

Even whilst we contemplate the operation of the causes which occasion this malady, the wretchedness and distress which precede the outbreak of it, and the extent of contamination of the circulating fluids, and the disorganisation of the several structures which characterise it; and even while we reflect on the numbers which are liable to suffer from these causes, we feel assured that it is in our power to prevent or to remedy these effects, if we be provided with the ascertained means, and if the causes admit of being removed. Unfortunately, however, these causes are not often removable, even when they are the results, as they often are, of human agency, and are produced by the cupidity and villany of man. Contractors may supply diseased or unwholesome food, both animal and farinaceous, to armies and fleets; and the examiners appointed to ascertain the soundness of provisions may collude with contractors to prevent the detection of the horrible crime until all means of prevention and of remedy are beyond reach. The evils thus produced on an extensive scale may, by similar agencies, be occasioned to a more limited extent in ships or in garrisons; and all preventive and medical means may, with little less culpability, be unprovided, or placed neglectfully beyond the possibility of obtaining them. We have only to refer to the history of our own country at the close of the 17th and the commencement of the 18th centuries, and to the results furnished by the wars in Ireland and in the Low Countries, and by the diseases in our armies and fleets at these periods, both for an estimate of the ravages of scurvy and its associated maladies, and for an account of the criminal agencies concerned in their production.

The comparatively rare occurrence of scurvy in this country, in its fleets and armies, and in its mercantile navy, during the last quarter of the 18th century and the first quarter of the present century, had in some degree diverted the attention of public authorities from the causes and the prevention of this very important, and, on many occasions, pestilential malady. As respects the fleets of this country, the favourable results observed during many years were attributable to due attention having been directed to the means of prevention — to the avoidance, as far as possible, of exposure to cold and humidity, to greater care in preserving the water in a pure state, to a more liberal supply, and to a more careful examination of provisions. Unfortunately, however, in very recent times, circumstances and causes favourable to the prevalence of the disease, especially in our armies in the East, occurred; and, notwithstanding the shorter duration of voyages of fleets and trading vessels, the want of attention in too many instances to prophylactic measures produced the usual bad consequences. As on almost every occasion for hygeienic measures, and in every disease, so in this, the most salutary and the most efficient means of prevention have been ascertained and promulgated by medical men, who, notwithstanding their admitted philanthropy, were not only unrewarded, but illiberally treated, by governments and by the public generally.

The causes of scurvy, and the means of preventing the evils produced by them, when the causes are neither very complicated nor very formidable, have been long ascertained, and have generally been rendered practically available. But, unfortunately, the nature and the sources of the causes have been such as often to preclude both prevention and cure; and the intensity and combination of causes have often not only spread the disease, but also imparted to it more malignant and more fatal characters. — The simpler states of scurvy, arising from less severe and more common causes, are converted into a most diffused and irremediable pestilence by increased intensity of the causes, especially by insufficient and unwholesome food, by foul waters, by overcrowding and imperfect ventilation, by cold and humidity, by excessive labour in trenches, fortifications and unhealthy localities, by despondency and want of sleep, more especially when armies, fleets, and besieged towns are subjected to these miseries. In these circumstances, amongst numerous cases of fully and rapidly developed scurvy, others closely allied to them in their nature, but even more fatal in their tendencies, especially scorbutic dysentery, putro-adynamic fever, and hospital gangrene, soon make their appearance, increase in numbers, and very remarkably augment the mortality. If the separation of the sick from the healthy, and if due ventilation be not enforced as soon as the occurrences take place, the malignancy and danger of these diseases are further increased by the generation of infectious emanations, which often remarkably accelerate a fatal issue. This is no overcharged picture, for whoever of those living at the middle of this century who have had an opportunity of observing the maladies produced in and by armies and besieged cities, &c., more especially on the continent of Europe, in the early part of the present century, must admit that it is impossible to portray the amount of suffering and of wretchedness, of disease and deaths proceeding from these causes. Similar results will follow these causes again, and whenever wars, unhealthy encampments, insufficiently supplied commissariats, the criminality of contractors, imperfect means of preventing and of curing disease, crowded and improperly placed hospitals, &c., combine to develope them; and they will appear to an extent and with a fatality co-ordinate with the intensity and the combination of these causes — causes which have been productive of a very much greater sacrifice of human lives, and with much greater sufferings, than all the battles and sieges which have been recorded.

2. I. Historical Sketch.— Some writers have supposed, with Sennertus, Mead, and Milman, that scurvy was known to the ancients, whilst others have believed, with Friend, that there is nothing to be found in their writings to warrant this supposition. Hippocrates, in mentioning enlargement of the spleen — σπλὴν μέγας — notices but one symptom which is applicable to scurvy, and that is ulceration of the legs; and, in describing Convolvulus Sanguineus — Εἰλεὸς αἱματίτης — he adduces the dark discoloration of the skin, the eruption of ulcers on the legs, and the difficulty of walking, as more particularly distinguishing it. But these remarks are insufficient to show that he was actually acquainted with true scurvy. It has been supposed that the disease, with which Pliny states the army of Cæsar Germanicus to have been afflicted after a long encampment in Germany beyond the Rhine, near the sea-coast, and which was ascribed to the water which was drank, was that now under consideration. He states, that "the teeth dropped out, and the knees became paralytic. The physicians called the malady *Stomacace* and *Sceletyrbe*. They discovered a remedy against it, viz. *Herba Britannica*." What this plant, of which Pliny adds a very short and imperfect description, actually was has not been shown by his commentators. Subsequent ancient writers, not even the Arabians, have furnished nothing in addition to what I have now adduced.

3. The earliest account of scurvy is that given by the Sieur Joinville, as it appeared in 1260, in the army of Louis IX. in Egypt, owing to the nature and scarcity of the food, and the scarcity of water. The next notice taken of it is by Fabricius, who states that it was very prevalent and fatal in Misnia, during 1486. As soon as long voyages were undertaken, scurvy appeared in an unmistakeable form. During the voyage of Vasco de Gama, who first made the passage to the East Indies, by the Cape of Good Hope, more than one hundred of his men out of one hundred and sixty died of this malady. The History of Portuguese discoveries, by W. Lopes de Castennada contains the relation of this voyage, which furnished the first account of this disease as it occurred at sea.

4. That scurvy was not then, nor for some time afterwards, known, is evident from the account given by Cartier of his second voyage to Newfoundland in 1535. After mentioning the characteristic symptoms, he adds that, "about the middle of February, of a hundred and ten people there were not ten whole." "Eight were already dead, and more than fifty sick, seemingly past all hopes of recovery. This malady being unknown to us, the body of one of our men was opened to see if by any means possible the occasion of it might be discovered, and the rest of us preserved. But in such sort did the calamity increase, that there were not now above three sound men left. Twenty-five of our best men died; and all the rest were so ill, that we thought they would never recover again. When it pleased God to send us the knowledge of a remedy for our health and recovery." The remedy was a decoction of the leaves and bark of a tree, which was called by the natives *ameda* or *hamuda*, and which has been considered to have been a species of spruce-fir.

5. Dr. Lind states, that the name of this disease

is said to be mentioned in the history of Saxony, by Albert Kruntz; and if so, he will be found the first author now extant who calls it the scurvy. It is next taken notice of by Euritius Cordus in his *Botanologicon*, published in 1534, where it is observed that the herb chelidonium minus is called by the Saxons *Scherbock rout*, being an excellent remedy for that disease. In the year 1539 it is mentioned by J. Agricola in his *Medicina Herbaria* Olaus Magnus, in his history of the northern nations, published in 1555, observing what diseases are peculiar to them, gives a long description of scurvy, mentioning that it is vulgarly called *Schoerbuck*, which is synonimous with the cachexia of the Greeks. He refers it chiefly to the nature of the food, and mentions, that the habitual use of absinthiated beverages is had recourse to in order to prevent and to cure it. About this period four treatises on the disease were published by Ronsseus, Ecthius, Wierus, and Langius. Forestus states, that the description by Ecthius was contained in an epistle sent in 1541 to *Blienburchius*, a physician in Utrecht. The first book published expressly on scurvy was by Ronsseus, who remarks, in a reprint, that if he had first seen the accurate description by Wierus, his own should not have been published.

6. Wierus states, that scurvy had been long peculiar to the inhabitants of the countries near the North seas, and that he had never met with it in Spain, France, or Italy, nor in Asia or Africa. There can be no doubt of the existence of scurvy in the northern countries of Europe from the earliest ages, although no account of it had appeared previously to the appearance of the works now mentioned; and it is equally manifest that years of scarcity, wars, sieges, &c., must have rendered it more or less endemic, or even epidemic, in various places and localities. During severe winters and early spring, the food of the inhabitants of these countries, the dried and imperfectly-cured meats and fish, and the want of succulent and other vegetables, particularly in the countries adjoining the Baltic, and the Northern and German Oceans, must have occasioned a remarkable prevalence of this malady, even although nature had provided them with the best preventives and means of cure, *in the spruce-fir and numerous other anti-scorbutic plants and herbs*, with which they abound. The comparatively recent culture of succulent vegetables, and more especially of the potato, in these countries, accounts not only for the rarer appearance of this malady in these parts in recent times, but also for the prevalence of it during earlier ages.

7. Of the four ships which sailed from England the beginning of April, 1609, for the establishment of the East India Company, three were so severely visited by scurvy as to have lost nearly one-fourth of their crews when they arrived at the Cape of Good Hope. The commodore's ship was not attacked. This immunity arose from three table-spoonfuls of lemon-juice having been served daily to each of his men. Notwithstanding this evidence of the success of lemon-juice in preventing scurvy,—evidence the most conclusive,—this valuable remedy and preventive was altogether slighted for 150 years afterwards, although scurvy destroyed often one-half or three-fourths of the crews of our fleets, and was more destructive to our armies than either battles or sieges, independently of the deaths it occasioned, both on land and at sea, in trading vessels. Sir R. Hawkins states, in his observations on his voyage to the South Sea in 1593, that upwards of ten thousand mariners had died of scurvy under his own observation alone, during the twenty years that he had been at sea. (Purchas's *Collect. of Voyages*, vol. i. & iv.) Admiral Hosier, who sailed in April, 1728, with seven ships of the line to the West Indies, buried his crews twice, and died broken-hearted in consequence. Lord Anson's expedition, at the end of two years from its leaving England in 1740, had lost from this disease more than four-fifths of the number that sailed in it. The voyages of Drake, Cavendish, Dampier, Byron, and of numerous other navigators, furnish similar details, and show how recklessly the lives of sailors were sacrificed.

8. But it was not only in fleets and single ships that scurvy was so destructive, but also in towns, fortifications, camps, and armies, and wherever the population was subjected to the causes which occasioned it in fleets. That scurvy was endemic, and also epidemic, in northern European countries, has been stated to be manifest from the early works on the disease, and from the nature of the food upon which their inhabitants subsisted. Owing to the difficulty of procuring fresh, succulent vegetables, and from their ignorance of the disease and of its several preventives and cures, the early frequenters of Hudson's Bay, of Newfoundland, and the coast of Labrador, were frequently almost altogether destroyed; and the early French settlers in Canada experienced so severe losses in winter and early spring from this disease, as almost to induce them to abandon the settlement.

9. Whilst sporadic cases of scurvy were of frequent occurrence, the ravages of the disease were often great in winter and spring, especially in years of scarcity, and in besieged towns or fortifications, and in armies. Vander Mye states that, during the siege of Breda by the Spaniards in 1625, the garrison and inhabitants were grievously afflicted with this disease, 1608 soldiers having been attacked up to the fourth month of the siege, the numbers having increased daily until the place surrendered in June, after a siege of eight months. Backstrom has recorded that, in 1703, when Thorn in Prussia was besieged by the Swedes, 5000 of the garrison, besides many of the inhabitants, were carried off by scurvy during the five months' siege; the besiegers being altogether exempt from it. During the war between the Austrians and Turks in 1720, "when the Imperial army wintered in Hungary, many thousands of the common soldiers, but not one officer, were cut off by scurvy. Dr. Kramer, physician to the army, being unacquainted with a remedy for it, requested a consultation of the College of Physicians at Vienna. Their advice was, however, of no avail; the disease, which broke out at the end of winter, continued until, at the approach of summer, the earth became covered with greens and vegetables." Backstrom (*Observat. circa Scorbutum*, &c., 1734) states, that both in the siege of Thorn and in the Imperial army, as soon as the former was raised, and vegetables and greens from the country were admitted into the town, and when the latter procured the same articles of food, the disease entirely disappeared. From these and other facts he concludes, that

abstinence from recent vegetables is altogether and solely the cause of the distemper, and so these alone are its effectual remedies.

10. Dr. Nitzsch in 1747 gave a detailed account of the prevalence of scurvy in the Russian armies, especially at Wiburgh, and during the siege of Asoph, in 1736. At these and other places, the mortality was great during winter and spring, and was, as on most other occasions, ascribed to the unwholesome nature of the food, and the want of fresh succulent vegetables. In the spring of 1760, the British troops, forming the garrison of Quebec after its capture from the French, suffered so severely from cold, and the want of vegetables, that before the end of April, 1000 of them were dead of scurvy, and more than twice that number unfit for service. M. Fodéré states that scurvy was remarkably prevalent in the French army of the Alps in 1795; and Larrey says that, in 1801, during the siege of Alexandria, which was commenced in May and ended with August, 3500 scorbutic patients were received into the military hospitals of the city. During the war in Siam and Ava the Native and British troops suffered most severely from scurvy and scorbutic dysentery*, owing to causes which will be referred to in the sequel. In 1836, the troops in the province of Adelaide, near the Cape of Good Hope, also suffered severely from scurvy, although abundantly supplied with good fresh meat; but they had been long without fresh vegetables and fruit. Scurvy was seldom or never seen in Great Britain since the end of the last century, up to 1847, excepting in gaols and penitentiaries. In 1823 it appeared in the form of scorbutic dysentery in the Millbank penitentiary, owing to a poor and watery diet, without fresh or succulent vegetables; and, in 1836, 37, and 38, it occurred in several gaols, owing to the same causes, more especially to the privation of fresh succulent vegetables. During the early months of 1847, 48, and 49, scurvy has appeared in various parts of England, Scotland, and Ireland, owing chiefly to the potato-blight. The *Literary History* of this disease will more fully appear from the Bibliography and References appended to this article.

11. II. Description.— i. Of the *symptoms of scurvy*, the earliest are observed in the countenance. The face, as well as the rest of the surface, is pale and bloated. The carunculæ of the eyes and lips have a dirty or greenish hue. The expression of the features is depressed. The gums are swollen, spongy, soft, livid, and bleed on the slightest friction. The odour of the breath is offensive. The patient complains of lassitude and debility, frequently of pains in the lower extremities, resembling rheumatism. He is averse from any kind of exertion; and when he attempts to exert himself he complains of stiffness of the joints, feebleness of the limbs, of panting or breathlessness, and of extreme fatigue. The skin is dry and harsh, and it generally continues dry throughout the course of the malady. Sometimes it is rough, resembling the goose-skin appearance; but it is more frequently shining with patches, streaks or spots of a reddish brown, bluish, greenish, black or livid hue, resembling those following a severe bruise. The size of these patches varies from a small point to that of a hand breadth, and it generally increases with the progress of the malady. The patches are first observed, and are most numerous, on the legs and thighs; but they soon appear on the arms and trunk, and on the scalp; very rarely on the face, which, however, assumes a more dingy and bloated hue. The ankles swell and the legs and feet become œdematous. In addition to these, the patient often complains of shifting pains; and, if the disease have supervened upon rheumatism or ague, these pains are more or less severe, and are referred to the bones, to the back, thorax, or joints. When the disease follows ague, obscure or irregular remissions or intermissions of febrile symptoms are observable, and more or less enlargement, with pain in the region of the spleen, is often detected. The above may be considered as the *first or early stage* of the distemper.

12. These symptoms may continue a longer or shorter time, or may be removed quickly by an appropriate treatment; but otherwise they may remain stationary; or, if the cause continues, they increase in severity. The gums become more tumid, more livid, and bleed from the slightest touch, and the breath remarkably offensive; the patches on the surface of the body enlarge, increase in number, and present a deeper and darker ecchymosed appearance. The pains are more severe, and are accompanied with swellings of the hams, stiffness and contractions of the knee-joints and ankles, and often with a brawny-feel of the parts owing to effusion of lymph between the integuments and aponeuroses, preventing the motion of the skin over the swollen parts. With the exudation of lymph, red globules, &c. into the tissues, chiefly into the connecting cellular tissue, and periosteum, exudations of blood take place, giving rise to more or less marked *hæmorrhage* from mucous canals, especially from the nostrils, mouth, and bowels, and from the vagina; much more rarely from the bronchi, urinary organs, and stomach. The tendency to hæmorrhage increases with the progress of the malady, and the loss of blood is often so great as to rapidly sink the vital powers of the patient. In *this advanced stage*, the livid patches are generally associated with hard and painful swellings in various parts, particularly in the lower extremities, and in the calves of the legs; and these often pass into superficial fungous ulcers. Old cicatrices frequently open afresh, and become the seats of foul scorbutic sores. The teeth fall out; the gums present foul, livid, spongy ulcers. The respiration becomes remarkably short and hurried on the least exertion, and deliquium or faintness is apt to supervene. The contractions of the joints, the œdema, induration, and pain of swollen parts, the discolouration of the patches, and the number of the ulcers, are all more and more developed; and the debility and vital depression greater.

13. From the commencement of the disease the *alvine evacuations* are more or less disordered. The stools are morbid; but, at first, they are not so remarkably so as to attract attention, and costiveness is then often experienced; but, as the disease

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* During 1827, the Directors of the East India Company allowed me to inspect the Regimental and other returns preserved in the India House, respecting the Causes, Nature, and Treatment of this disease as it occurred in the expedition to Ava, and of the Cholera then prevalent in India.

advances, they are not only much disordered, but are much more frequent and very offensive. Diarrhœa and colicky pains often supervene; and, with more or less attendant hæmorrhage, rapidly sink the patient at this stage. Under certain circumstances, the disease passes into a state of scorbutic dysentery, or dysentery and scorbutus supervene upon each other, and thus become associated, as shown when treating of DYSENTERY (*see that art.* § 39. *et seq.*). The *urine* is scanty and high-coloured (see § 20.).

14. The *pulse* is often little affected at an early stage; but is more generally slower and feebler than in health; but, in more advanced cases, or when the malady is associated with some degree of asthenic or sub-inflammation in the seats of effusion, the pulse is often remarkably frequent as well as small or weak. When the pulse is slow and feeble, the patient is often chilly, the surface cool, and the temperature of the body lower than natural. This state of the disease was called the *cold scurvy* by the earlier writers. When much swelling and hardness, with pain, is occasioned by effusion in the connecting cellular tissue, or even below the periosteum, the pulse is generally frequent, varying from 100 to 120 in a minute, probably owing to some degree of inflammatory irritation produced by the effused matters in these situations, as indicated by the great tenderness which always is present. This state of febrile action gave rise to the distinction of *hot scurvy* according to various authors.

15. The *tongue* is generally clean and pale, but commonly broad, flabby, and indented at its edges by the teeth. The insides of the cheeks and lips are pallid, and contrast remarkably with the appearance of the gums. *Thirst* is not much complained of, unless in the more febrile state of the disease, or when the supply of fluids is scanty. The *appetite* is not impaired. It may be even greater than in health; and digestion is not very manifestly impaired. *Sleep* is not deficient, unless at a far advanced stage, when wakefulness or disturbed sleep is experienced. The *mental faculties* are not impaired, although the spirits are generally more or less dejected, and anxious; but towards a fatal issue the patient becomes indifferent and torpid. The memory is generally unimpaired; but the eye-sight is occasionally weakened.

16. As the disease approaches an unfavourable issue the *breathing* becomes remarkably frequent, and the *dyspnœa* extreme. The patient coughs, and expectorates a frothy mucus, sometimes tinged with dark blood. The chest was generally every where resonant on percussion; the respiratory murmur was loud and distinct; and the sounds of the heart were loud and extensive, but unaccompanied by any morbid bruit in six cases examined by Dr. BUDD. In the most advanced states of scurvy not only may ulcers and injuries or wounds which have healed up for many years break out afresh, but old and well-united fractures may become disunited. The tendency to *swoon* in the most severe cases is sometimes so great that the slightest motion, or the erect posture, or even any trifling exertion, may be followed by fatal syncope. It is stated in the account of Lord ANSON's voyage, that many of the men, although confined to their hammocks, ate and drank heartily, were cheerful, and talked with much seeming vigour, and in a strong tone of voice; and yet, on their being the least moved, although it was only from one part of the ship to another, and that in their hammocks, they have immediately expired; and others who have confided in their seeming strength, and have resolved to get out of their hammocks, have died before they could reach the deck. And it was no uncommon thing for those who could do some kind of duty, and walk the deck, to drop down dead in an instant, on any endeavours to act with their utmost vigour.

17. Emaciation is not necessarily a phenomenon of the disease, unless there has actually been considerable privation of food; but it is occasionally observed, and anæmia is not infrequent. Dr. BUDD observes that, although there is a remarkable tendency to the breaking out of old ulcers or wounds long previously healed, yet there is very little disposition to the occurrence of bed-sores from pressure. The separation of the epiphyses from bones has been mentioned by some writers, as having occurred in children attacked by this malady, but it has not been often observed in adults, or, if observed, not mentioned by many writers.

18. *Scorbutic ulcers* exude a thin, fœtid, sanious fluid, instead of pus. Their edges are of a livid colour, and as if puffed up; a coagulum soon forms on their surfaces, which is separated or wiped away with difficulty. The parts underneath it are soft, spongy, or putrid. When this coagulum is removed, the same change again occurs after a few hours, forming a soft, bloody, fungus, resembling boiled bullock's liver. This fungus exudation, Dr. LIND states, sometimes rises in a night's time to a great size, and, although cut off, in which case a plentiful hæmorrhage generally ensues, at the next dressing is as large as ever.

19. ii. THE CHEMICAL ANALYSES OF THE BLOOD AND URINE in scurvy have been few, and even these unsatisfactory. It is manifest that the states of the blood and of the excretions in this disease will depend much upon the treatment adopted, and upon the time during which the treatment has preceded the analysis.—*A*. SIMON's "Animal Chemistry" furnishes no information as to the *blood* in scurvy; but Dr. DAY, in his additions to the work, states that Mr. BUSK, in three well-marked cases of scurvy, found the composition of the blood as follows; comparing the scorbutic blood with the healthy according to his analysis of the latter:—

	1st Case.	2nd Case.	3rd Case.	4th. Heal. blood. (*Busk*).
Water - - -	849·9	835·9	846·2	789·8
Solid constituents -	150·1	164·1	153·8	211·2
Fibrin - - -	6·5	4·5	5·9	3·3
Albumen - -	84·0	76·6	74·2	67·2
Blood-corpuscles -	47·8	72·3	60·7	133·7
Salts - - -	9·5	11·5	10·9	6·8

Although the fibrin appears to be increased, its vital cohesion is evidently impaired; and the albumen is certainly altered in quality, although the alteration is not shown by chemical analysis.

20. *B*. The *urine* in scurvy is commonly of a dark, reddish brown, and sometimes of an almost black colour. Although it is slightly acid as it is evacuated, it very soon becomes alkaline, and emits a strong and disagreeable ammoniacal odour. Blood is often discharged with the urine, and the urine then assumes a dark reddish-brown colour, in consequence of the presence of hæmato-

in this case it developes hydrosulphate of ammonia, and soon becomes putrid. Dr. Simon examined the urine in three cases of scurvy in Schönlein's clinical wards — two men and one woman. The urine was very similar in these three cases, in its physical characters. It was scanty, and of a deep, dark-brown colour; after standing a few hours it emitted a disagreeable ammoniacal odour. The three specimens resembled each other, and were found to approximate the chemical characters of the urine in typhus. The urea was less than in healthy urine, not exceeding 25 30ths of the solid residue. The fixed salts were diminished in the two male cases, being 14-18ths of the solid residue; but in the female they were 27, or a little above the normal average (25). The uric acid was slightly above the healthy standard in all, being from 1 to 3 of the solid residue.

21. iii. Appearances on Dissection. — Scurvy at the present day seldom proves fatal, unless in ships, or in besieged towns, where opportunities of minutely examining the bodies after death are rarely enjoyed; and the observations of early writers on this subject are generally devoid of precision, and the necessary details. The best account of the appearances after death has been furnished by Dr. Budd, from the cases which were brought to the *Dreadnought* Hospital Ship. He states, "The general inferences to be drawn from preceding facts are, that in the *inspection* of the bodies of persons who die of scurvy, the chief indications of that disease are met with in the colour of the skin, in the state of the gums, and in the presence of fibrinous effusions, and of ecchymoses, or effusions of blood. These effusions occur most frequently in the skin, in the subcutaneous cellular tissue, and between the muscles of the lower extremities, between the periosteum and bones of the lower extremities and of the jaws; and in the peritoneal coat, and in the muscular and mucous coats of the intestinal canal. The numerous traces of hæmorrhage observed in the coats of the intestines are in accordance with the frequency with which scorbutic persons pass blood by stool."

22. The slight effusions of blood between the periosteum and bone do not destroy the muscular connections between these parts, so that the latter does not generally present further alteration. Beyond a paleness of tissue, there is no change characteristic of scurvy observable in the brain. The organs of respiration, the heart and large blood-vessels, the glandular system and the bones, presented no remarkable changes in the cases inspected by Dr. Budd. His observations furnished him with no direct information respecting the *blood*, except that it is deficient in red particles; that it does not impart a stain to the lining membrane of the heart or vessels; and that it has not lost the property of coagulating. The change observed in the skin and in the complexion is to be ascribed to the alteration of the blood, and the hæmorrhages doubtless proceed, at least in part, also from this alteration. Former writers have noticed more or less of a fluid or dissolved condition of the blood, and a soft, flabby state of the *heart*; this latter change accounting for the swooning and fatal deliquium sometimes occurring in the more extreme cases. The *liver* has been found pale, or of a pale buff colour, or of a nutmeg appearance; and the *bile* in the gall-bladder of a pale or yellowish colour. The *spleen* is generally soft, of a plum colour, and often more or less enlarged. The *lungs* are sometimes œdematous, especially in their more depending parts. The *kidneys* and urinary passages seldom present any change in the uncomplicated states of the disease.

23. According to the descriptions of Poupart, Lind, and others, the blood discharged from the mucous canals during life, as well as that found in the cavities of the heart and vessels after death, was remarkably altered, fluid, broken down, and presented more or less of a greenish-black hue. The spleen was generally much enlarged, and so soft as to break down on being handled. Adhesions often existed between the costal and pulmonic pleura, and sometimes dirty serous effusions were found in the pleural cavities. Black, corrupted blood was generally effused between the muscles, or infiltrated between their fasciculi, and under the skin and periosteum; and the auricles were remarkably distended by coagulated blood, in those who died suddenly. In young subjects the epiphyses were loosened from the shafts of the long bones, and the ribs had separated from their cartilages. In some, the glands of the mesentery were more or less enlarged. The kidneys were occasionally altered. The alterations found in the bones, especially those now mentioned, most probably arose from the effusion of blood between the periosteum and osseous structure, and from the consequent destruction of the vessels of the former which nourish the latter.

24. iv. Complications, &c. — Much of the diversity observed in the symptoms and progress of scurvy, as well as in the appearances after death, depends upon the nature of the food, or of the privations causing the malady, and upon antecedent, concurrent, or intercurrent disease; for, as will be shown in the sequel, although the privation of fresh vegetables and fruit is mainly productive of it, still much is owing to the food upon which the patient has been living up to the time of his attack and during its progress. The diseases which commonly precede and favour the appearance of scurvy are agues and remittent fevers, enlargement of the spleen or liver, rheumatism, dysentery or chronic diarrhœa; and either of these may complicate, in a more or less evident manner, the scorbutic state, especially in its more chronic form, or may appear as an intercurrent malady. These complications are most apt to occur in warm or temperate climates, and wherever malaria is present; and probably the association with rheumatism is most common in colder regions and seasons. When they do appear they are readily recognised when the physician is alive to the probability of their association, and when the causes, on which they chiefly depend, are observed to be in operation. The supervention of scurvy upon ague, or upon enlargements of the spleen, or upon affections of the bowels, is not infrequent, especially in the winter and spring months, when fresh vegetables and fruits have become scarce, and when cold, humidity, and these diseases have predisposed the frame to this malady; and it was certainly much more common in former ages, before potatoes came into general use.

25. *The complication of Scurvy with Dysentery* was the most prevalent and fatal disease during

the Burmese war, and was entirely owing to the nature of the food in connection with malaria and bad water. But it is unnecessary to add, at this place, to what I have stated when treating of the *forms and complications of* DYSENTERY (see § 39. *et seq.*)—Although *rheumatism* is undoubtedly in some cases, and at certain seasons, occasionally associated with scurvy, still the pains, which are most commonly attendant upon the latter, are rather to be imputed to the infiltrations of blood which take place between the muscular fasciculi and under the periosteum, than to any rheumatic complication. A moderate attention to the matter will be sufficient to distinguish the nature of the case; as well as the existence of enlargement of the spleen, and the connection of the disease with ague.

26. Persons labouring under scurvy are very liable, when exposed to cold and humidity, to experience severe attacks of *pleurisy*, or of *pericarditis* or of *peripneumonia*, or of *bronchitis*, which may carry off the patient in a short time, without materially influencing the symptoms of scurvy. In these cases, the dyspnœa, cough, and difficulty of expectorating become urgent; the expectoration varying with the state of pectoral disease, from a slight mucous frothy matter, to a dirty brown, or dark-red, or sanious substance. Effusion into the pleural cavities, or effusion into the air-cells and small bronchi, and splenification of the substance of the lung, ultimately hasten or occasion a fatal issue. In rarer instances changes in the *kidneys*, which I have ascribed to cachectic inflammation of the secreting structure of these organs (see art. KIDNEYS, § 80. *et seq.*) supervene, and, by embarrassing the functions of these organs, superinduce dropsy upon the scorbutic disease, and thereby occasion or accelerate an unfavourable termination.

27. III. DIAGNOSIS.—Of the numerous writers who preceded LIND, very few pointed out with due accuracy the diagnostic characters of scurvy, or distinguished sufficiently between this disease and *malignant or putrid fevers*. In many circumstances and on many occasions, some of which I have myself witnessed, it is difficult to determine as to the presence of scurvy or of putrid fever, at first sight, or until a more patient and close observation has shown the difference, so insensibly or gradually, in such circumstances, some of which I observed in Germany and France after the last war, does the one malady approach the characters of the other. In Ireland, in 1847, owing to the failure of the potato-crop and general misery, scurvy was intimately associated with putro-adynamic fever, and it was most difficult to distinguish between them, or to say which was the primary malady. The same observations equally apply to *purpura*, which often arises from similar causes to those producing scurvy, and is more or less closely allied to, although generally distinguished from, scurvy, the more extreme points of difference between the two having been laid hold of as diagnostic characters, whilst the closest resemblances have been kept out of view. It will be more just, more conducive, moreover, to accurate pathological views, and certainly tend more to the adoption of sound indications and means of cure, to look closely at diseases as they occur in practice, to consider both alliances and differences, and to proceed in our treatment on the comprehensive basis thereby furnished us.

28. Circumstances have occurred, and may occur again, in which certain of the causes of malignant fever, as a confined impure air, crowding of numbers into a small and ill-ventilated space, &c., have come into operation, in connection with the causes of scurvy, especially a deficiency or want of fresh vegetables and fruit, and have given rise either to the petechial or putro-adynamic form of fever, or to a state of febrile scurvy, or to a disease, in which the symptoms of either the one or the other predominated, according as the causes of either prevailed. In attempting to distinguish between these diseases, or to determine the existence of either, the discriminating physician will be guided by the slow and gradual, or the rapid accession of the symptoms; by the states of the skin, of the gums, and of the teeth; of the general surface, and particularly of the lower extremities; by the discolouration and other changes there observed; by the presence or absence of complete prostration and of other febrile phenomena; by the acuteness or intensity and duration of the malady; by the appetite and function of digestion; by the inability or capability of leaving the bed; and by the presence or absence of contractions of the lower extremities, or of hardness, swelling and livid patches or ulcers in these situations.

29. In distinguishing also between scurvy and *Purpura*, the presence or absence of the majority of the above symptoms, and more especially the states of the gums and teeth, the swellings, indurations, livid blotches, œdema of, or the fungous ulcers on, the extremities; the contractions of the joints; and various associated phenomena, will guide the physician to a correct diagnosis, and whilst they indicate with due precision the existence of either the one or the other, will at the same time point out the close alliance between both as to their causes and their natures. (See PURPURA (§ 23.).

30. IV. THE PROGNOSIS OF SCURVY. — Before the disease is advanced so far as to present contractions, indurated swellings or fungous ulcers on the extremities; or hæmorrhages from mucous canals; or swoonings upon assuming the erect posture or on slight exertion, a speedy recovery will generally follow the use of the means about to be recommended; but when the malady is thus far advanced, although the same means will often save the patient, they may also fail; and this unfavourable result is the more likely to ensue if, with these symptoms, the patient complains of dyspnœa, and oppression at the chest; if his respiration and pulse be very frequent; if there be any pulmonary, pleuritic or dysenteric complication; if dropsical effusions or albuminous urine supervene; if the spleen be much enlarged; and if hæmorrhages from the bowels be copious, then great danger may be apprehended, and with still greater reason, if the adoption of a suitable diet and remedies is not soon followed by any amendment.

31. In cases which present not the extreme symptoms characteristic of scurvy, and are nevertheless unamenable to the usual scorbutic remedies, some complication should be looked for and ascertained, as this most probably either retards or prevents the efficacy of such means, or the disease partakes, owing to the causes above noticed (§ 28.), more or less of the characters of putro-

adynamic or petechial fever — possesses the intermediate form already mentioned (§ 27.), and requires an appropriate method of treatment. I am persuaded, that the instances of scurvy which have been adduced of the failure of these remedies, have either been the severer, or pulmonic, pleuritic, pericardiac, dysenteric, or dropsical complications of the distemper, or those intermediate states of disease now alluded to.

32. V. CAUSES OF SCURVY. — The causes of scurvy were only partially known until a comparatively recent period; for the disease was often ascribed to one only of the causes, and that a predisposing cause; and even now, when the chief causes have been duly recognised, others which either predispose the frame to their operation, or concur with them, and aid or determine their effects are too generally overlooked, and their influence in modifying the malady, or in delaying or preventing the beneficial operation of the means employed, is altogether neglected, or even unknown. It has been fully ascertained that several of the causes to which scurvy was formerly imputed are not really the exciting or efficient causes of this malady; but their influence as predisposing, concurring, or determining causes should not be denied, although they cannot take the highest rank in causation, or because they have been pushed from the position formerly assigned them, by others of much greater influence.

33. i. PREDISPOSING CAUSES. — Several of these causes were formerly believed to have had the chief share in the production of scurvy; but they are now more clearly proved to perform a less important part; but this part they fill in the causation not only of this malady, but also of dysentery, putro-adynamic fever, purpura, and probably of other diseases.—*A.* Much importance was attached formerly to living on *salt provisions*; and as this disease most frequently and certainly appeared in ships provisioned with salted meats chiefly, so it was inferred that these were the causes of its occurrence. That salted meats are not more productive of scurvy than fresh meats, or at least not much more so, is shown by the prevalence of the malady, in the spring of 1720, in an army which KRAMER stated to have enjoyed an abundance of fresh meat at a low price: in the Russian armies, in 1736, which were similarly circumstanced; in the French prisoners, at the middle of last century, who had no salt provisions; and in the regiments at the Cape, in 1836, that enjoyed an abundance of fresh meat.

34. From these and other facts it may be inferred, that scurvy may appear even amongst those who have a sufficient supply of fresh meats, if there be a prolonged deficiency at the same time of succulent vegetables and fruits. Nevertheless, the question remains, are salted meats more favourable to the supervention of scurvy than fresh meats? I believe, after having paid some attention to the matter, that recently salted or uninjured salt meats, if they have been of a good and healthy description, and quite fresh when salted, are not materially more productive of scurvy than fresh meats; but whilst the quality of the latter is generally manifest, that of the former is not always so evident. The salted provisions supplied to ships have frequently been long cured, even before they are received on board, and are so often of the most inferior and unwholesome character, as to account in great measure for the appearance of cachectic maladies in those who live upon them. It was notorious, during Queen Anne's wars, that, owing chiefly to collusion between the heads of the commissariat or others in power and the contractors, and even in more recent times, that the salted provisions supplied to the navy and army often consisted not only of long or imperfectly cured meats, but also of the flesh of animals which had died of disease; that horse-flesh was often placed in casks of beef; and that similar villanous acts were not confined to salted provisions, but extended also to the flour and biscuits supplied to these services, both of these having been adulterated, and the latter mouldy and swarming in maggots and weevils. Owing to this cause, as shown by some medical writers of the day, a much greater number of human lives were lost from scurvy, scorbutic dysentery, and putro-adynamic fever—by diseases caused by the unwholesomeness of the provisions — than from all other diseases, and from naval and military actions, sieges, and other causes combined.[*]

35. Not only were both salted and farinaceous provisions frequently deleterious, but the supply also was insufficient to both army and navy, up to the mutiny at the Nore, the causes of which were generally misrepresented by those in power, and misunderstood or glozed over by historians. In times more recent, acts similar to the above have been perpetrated in more places than one. The returns made to the Medical Boards in India by the medical officers, and which are preserved at the India House, are full of complaints as to the unwholesome nature of the provisions supplied to the army in the Burmese war; even the rice having been either unripe or damaged. The remarkable prevalence of scorbutic dysentery, and low fever among the troops in that war, was ascribed chiefly to this cause; the mortality continuing great until more wholesome provisions were procured. But it was not only in the public services — in fleets, armies, and transport vessels — that these enormities were practised, trading vessels, emigrant ships, &c., were sometimes, and are occasionally up to the present day, supplied with the cheaper kinds of Irish provisions, which are frequently of a similar kind to that above described; and to this circumstance in part, and to others about to be noticed, should be ascribed the scurvy and fever so frequently breaking out in ships after their provisions have been used sufficiently long to produce their effects. To the unwholesomeness and nature of the food, and to the state of the water, even independently of the want of fresh vegetables and fruit, the diversity of characters presented by scurvy and fever in ships, armies, prisons, &c., is in great measure to be imputed, as well as the want of success in treating these diseases by the more usual remedies, or by those more generally found efficacious under other circumstances,—the same causes not merely

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[*] From a tolerably extensive field of observation in various parts of Europe and within the tropics, between the years 1815 and 1819 inclusive. I can state, that, of the various kinds of unwholesome cured meats, pork is perhaps the most injurious: especially when it has been imperfectly salted, or too long kept; and, more particularly if it have been coarsely fed, or diseased, or not cured immediately upon being killed: scorbutic and other forms of dysentery generally resulting.

predisposing to these forms of disease, but actually producing them, and giving them their distinctive features.

36. Much of the mischief observed in those who had lived long on salt provisions was formerly, and still is, by many imputed to the salt by which these are cured, or at least to the state of the provisions; and by others to the supposition that salted meats are not so nutritious as fresh. But, when these provisions have been from the first wholesome and good, have been salted while quite fresh, and have not been afterwards kept so long as to produce any sensible or unpleasant change, they may then be considered as having had no further share in the production of scurvy, even although it should have appeared during the use of such provisions, than that they have constituted the chief or only food, to the neglect of other articles requisite to correct the effects of so exclusive a diet, such as fresh vegetables and fruits. On this subject, Dr. Budd justly remarks, that "the circumstances showing that scurvy may prevail to a frightful extent among persons living solely on fresh meat; that persons who, from the nature of their occupations, are continually absorbing saline particles, are exempt from scurvy; that scurvy is not brought on by the use of sea-water, which may be drunk with impunity, even by scorbutic people; and that the disease may be prevented for any length of time in persons who subsist on salt provisions, and can be readily cured, even in those who continue the use of them, are sufficient to justify the conclusion, that salt has no share whatever in producing it." (p. 65.) To this statement I would merely add, that the salt conceals, and partly corrects, the sensibly noxious properties of previously tainted, diseased, or otherwise unwholesome meats, and hence meats of this description, when salted, are more readily, and perhaps less injuriously, partaken of, and, moreover, have not their injurious nature made so manifest, or even suspected, as if an attempt to use them in their fresh state were made.

37. *B.* Next to the state of *meat provisions*, that of *farinaceous food* supplied to ships, armies, &c., as predisposing to, or even as producing scurvy, may be noticed. In various countries in the East, where little or no animal provision is used, scurvy has nevertheless appeared, and has been ascribed, with sufficient reason, not so much to deficiency of the amount, as to the unwholesome nature, of the food, whether rice, Indian corn, &c., which often have been damaged, unripe, mouldy, or too long kept. The flour, biscuits and other farinaceous articles, supplied by contract or otherwise to the public services, and to trading vessels, were formerly, on many occasions, similarly damaged and unwholesome, or became so after having been kept for some time; and contributed their share towards the production of scurvy, fevers, and even to visceral disease. That these articles of food have actually been productive of these maladies, was demonstrated by the occurrences in the Burmese war; native Indian regiments subsisting entirely on rice and other farinaceous articles, which in that war was more or less damaged and unwholesome, having been universally attacked with scurvy and scorbutic dysentery.

38. *C. The water* also, with which ships of war and trading vessels were supplied for long voyages, having been kept in wooden casks, the use of iron tanks for this purpose being of recent date, the water became offensive and unwholesome, on many occasions so much so as to be nauseous and to require the addition of spirits to prevent its more immediate ill effects. The effects of marsh water in causing bowel complaints and enlargements of the spleen and liver, are well known to many who have possessed powers of observation in connection with the requisite opportunities. But I can say from personal observation, that water, long kept in wooden casks, however well these casks may have been charred, as they sometimes are on their insides, become even more deleterious to health, and much more offensive to the senses than any water taken from marsh-grounds or land-tanks, much, however, depending upon the state of the water when filled into the casks. The greater attention now paid to the supply, state, and preservation of water in the public services, and in trading vessels, is one of the chief causes of the less frequent appearance of disease in them, and more especially of scurvy and allied maladies.

39. *D. Cold and humidity* have long been considered as very influential in favouring the occurrence of scurvy. That these causes are of some importance, I can assert, although Dr. Budd strongly doubts their influence. But he has not viewed them in a proper light. He remarks that "the merchant seamen who enter the port of London, affected with scurvy, come almost exclusively from Mauritius, India, Ceylon, or China; and have consequently been in no higher latitude than that of the Cape." But he overlooks the circumstance that those voyages are long, and that the men have been living long upon cured meats, without a due supply of fresh fruits and vegetables; whilst most other vessels arriving at the port of London have had short voyages, they coming from much nearer countries, and consequently a sufficient period for the development of scurvy in them has not elapsed. It is not, however, the cold and moisture depending upon climate, or even upon weather, that are so influential in favouring the development of scurvy, as the cold and humidity arising from daily, and even twice daily, washing and scrubbing the decks, formerly and even still so much in use, to the neglect of dry-scrubbing and cleansing. The evaporation from the wet decks during day and night, consequent upon frequent washings during fine and dry weather, and the wet and humidity of body-clothes, bed-clothes, and hammocks, produced by these washings, and during foul or stormy weather, are the forms of cold and humidity which, on ship-board, predispose to scurvy, and more directly produce the several forms of rheumatism, chiefly by suppressing the cutaneous functions, by reducing nervous power, and thereby causing the accumulation of those excrementitious matters, the retention of which occasions these maladies. All the most experienced writers on scurvy have remarked the suppression of the cutaneous functions previously to the appearance of, and during the progress of scurvy, and I have no doubt of the fact from my more limited observation.

40. *E. Impure air* has been considered by some writers as predisposing, more or less, to the appearance of scurvy. The testimony of Lind, Trotter,

and Blane, most experienced physicians, is opposed to the opinion, that it has any influence either in the production, or on the course of this malady. That the influence is not very remarkable, may be admitted; but that this cause is not altogether without effect cannot be denied, especially in modifying or altogether changing the characters of the disease, when conjoined with those causes which more directly and commonly produce scurvy. It was observed in the American squadron, in 1846, that scurvy was most severe in vessels which were the worst ventilated.

41. *F. Several other diseases* predispose the frame to the appearance of scurvy; and although the predisposing influence has been attributed to the debility produced by those diseases, yet I believe that it is not the debility alone which predisposes, but more especially the nature of the malady. Agues, remittent fevers, enlargement of the spleen, and rheumatism, and previous disorder of the digestive organs, especially the former, have been generally considered by medical writers as more or less influential in the production of scurvy. The previously impaired assimilation and nutrition, and the consequent state of the blood, in connection with exhausted organic nervous energy, readily account for the readiness with which scurvy supervenes upon those maladies when its causes are in operation.

42. *G. The state of the mind* is influential both in predisposing to, and warding off scurvy; the depressing passions favouring the appearance, and the exciting emotions preventing or delaying the occurrence of the malady. Disappointed expectations; anxiety; hope deferred; longings to return to more desired scenes; prolonged confinement; a want of exciting, amusing, and exhilarating occupations; breathing the same kind of air, in the same locality; a monotonous and unexciting course of existence; losses of relations and friends, and extinction of those hopes or expectations which render privations endurable, — all have their influence in predisposing the body to scurvy or its allied states of cachexy.

43. *H. The seasons* have no small influence on the appearance of scurvy, but mainly in consequence of the privation of fresh vegetables and fruits, which is experienced chiefly during winter and spring; so that, in armies, as well as in fleets in, or departing from, cold or temperate countries, a deficient supply of those dietetic means of prevention is more likely to be experienced at those seasons than at any other. Suppressed perspiration, produced by the cold and humidity of these seasons, may also not be altogether uninfluential, as shown above (§ 39.), in favouring the evolution of this malady. In northern countries, where the inhabitants, the seamen, and the soldiers, live chiefly upon cured meat provisions, as salted and smoked meats, and dried fish, during winter and spring, and until the commencement of summer, when vegetables and fruits begin to appear, their constitutions have made considerable progress to the scorbutic diathesis; so that, when these preventive articles of diet cannot be obtained at this latter season, owing either to states of siege, and to the provisioning and other circumstances of armies or fleets, scurvy is then much more apt to break out in spring, and even in summer, than at other seasons.

44. *I.* The earlier writers on scurvy were inclined to ascribe a *contagious influence* to this disease, chiefly from the number attacked with it in the same place and circumstances; but it was clearly shown that contagion had no share in producing it, by Lind and others, who wrote about the middle and end of the last century, the causes inducing the malady being common to all affected by it in the same locality. But although the disease is actually uncontagious, it is by no means unreasonable to infer, that the putrid emanations from a number of persons in an advanced stage of the disease, confined often in very limited spaces, either on board of ships, in the crowded hospitals of a besieged town, or in crowded prisons, are not altogether innocuous, or are not without some influence in predisposing the body to this or some allied malady, arising from the contamination of the circulating fluids, and from the depression of vital or organic nervous power, by the accumulation of these emanations in the air which is respired for a longer or shorter time. Nor would it be improbable that the emanations arising from a number of scorbutic patients, in places insufficiently ventilated, may convert the scorbutic malady into putrid, maculated, or putro-adynamic fever, or into scorbutic dysentery, or even may more directly develope these diseases.

45. *K. Age and sex* have probably but little influence on the production of scurvy, for it is observed at all ages, and in both sexes; but there is no doubt that it occurs much more frequently in adults, or from early puberty until far advanced age, than in children, and in males than in females, chiefly in consequence of the greater exposure of adult males to the causes, owing to the circumstances in which they are liable to be placed.

46. ii. The exciting causes of Scurvy may be briefly stated to be the use, for a longer or shorter period, of all kinds of animal meats, too long or imperfectly cured or preserved; of dried, or smoked, or tainted meats or fish; or mouldy, old, damaged, diseased, or unripe farinaceous articles of food, to the exclusion of, or without possessing the advantages of, fresh or succulent vegetables and fruits, or of other preventive articles of diet, or of medicine; more especially when the use of the former kinds of food, and the want of the latter, are aided by one or more of the predisposing or concurring causes already considered. That the want or neglect of those vegetable productions which have been found so beneficial, both in preventing and in curing scurvy, has a greater influence in the production of the malady, than even the prolonged use of the several kinds of animal food, however cured or preserved, has been proved on various occasions. But it cannot be denied, that damaged, tainted, or too-long-cured substances, — pork, the viscera and blood of the animals generally used for food, — the flesh of animals which have died of disease, &c., are much more likely to occasion scurvy, and its various complications, than fresh and wholesome meats; although even these last may be followed by the disease, when too long or exclusively used, and when fresh vegetables and fruits cannot be obtained.

47. Although I cannot admit that scurvy is to be ascribed entirely and always to the absence or want of fresh succulent vegetables and fruits, as articles of diet, as contended for by Dr. Budd, yet I will not deny that such a privation is the most common and exciting cause of the malady, espe-

cially when no suitable means are employed—none of the numerous preventives about to be noticed (§ 54. *et seq.*) is had recourse to, in order to supply the deficiency, or to counteract the effects resulting from the nature or state of the aliments. In this, as well as in other diseases, we cannot with propriety ascribe the sole agency to one cause; generally more than one, frequently several, although of diversified amount of power, are concerned in developing the result, whether that result be simple, definite, or specific, or whether it be complicated more or less, or contingently associated.

48. iii. *The chief causes insisted on by writers on this disease*, were often approaches only to the truth; but these approaches were sometimes so near, as to lead to judicious means of prevention and cure, although certain subordinate agencies were often overlooked. Ecthius, one of the earliest writers on scurvy, assigns as causes, "gross, unwholesome food of salt, dried, or semiputrid flesh and fish, pork, spoiled bread, stinking water, &c." Ronsseus ascribed the frequency of scurvy in Holland to the diet and air, to eating quantities of water-fowl, but chiefly to living on flesh first salted, then smoked and dried, and to the season and weather. Wierus, who probably viewed cases of psoriasis as modifications of scurvy, and in this agreed with many who both preceded and followed him, more justly remarked the not unfrequent connection of scurvy with ague and malignant forms of fever; and, with sufficient reason, ascribes this distemper "to unwholesome air, and chiefly to such bad or corrupt food as was used in northern countries, and by their shipping, viz., stinking pork, smoked rancid bacon, mouldy bread, thick, feculent ale, bad water, melancholy and grief of mind, preceding fevers, the stoppage of usual evacuations, &c." Dodonæus imputed the scurvy in Brabant, in 1556, to the use of corrupted rye during a season of scarcity. Rostock, in a treatise published in 1589, remarks, that impure water and bad air aid unwholesome food in producing scurvy, and states, that the disease is endemic in several northern countries, and that scorbutic mothers often there bear scorbutic children, and often miscarry, or bring forth dead fœtuses. Brunner insists upon the influence of damp, marshy localities, and other sources of malaria, in producing scurvy, and ascribes more to the nature of the bread used by the inhabitants of those localities than previous writers. Horstius likewise insists upon the influence of malaria, and the use of new ale, without hops or any other bitter, in causing scurvy in various places in the North of Germany. Vander Mye notices, more particularly than any previous writer, the influence of the emotions and passions of the mind in causing and in preventing scurvy, and adduces the effects of occurrences which took place during the siege of Breda, in support of his views. In this siege he attributed the disease chiefly to the general use of old, spoiled, or musty rye, and to humidity; but other causes, both physical and moral, were also in operation. He adds, that "the distemper proved most fatal to the English soldiers, as they very early began to feed on dog's flesh, were in want of their beloved tobacco, and lay in the most wet or damp barracks. It was much less frequent among the Walloons and Flemings, they being more careful and delicate in their diet, and having much wholesomer quarters. Amongst the French it was more rarely met with, owing to their being stationed in the driest part of the town, and to their more sprightly dispositions."

49. J. Hartmann takes notice of the influence of mercury, and of mercurial courses, in predisposing to scurvy. In 1645, the medical faculty of Copenhagen published a consultation on the causes, prevention, and cure of the distemper, for the benefit of the poor of the country; and in this meritorious production, the influence of cold, humidity, malaria, and of unwholesome water and beverages, is insisted upon, as aiding the effects produced by food such as that already mentioned. Martin Lister, and many of preceding and contemporary writers, and subsequently Cockburn, Pitcairn, Boerhaave, and others down to the appearance of Bachstrom's work, in 1734, agree in ascribing scurvy to the use of unwholesome food and water, or to those causes chiefly which had been mentioned by their predecessors. But the last-named author was the first to demonstrate that, however much the food and water used were concerned in occasioning scurvy, *abstinence from recent vegetables was the chief cause of the malady, and the use of these the chief prevention and cure.* Notwithstanding this very decided opinion, and the very conclusive evidence Bachstrom furnished of its truth, the disease has been imputed by writers, down almost to the present day, rather to the prolonged use of cured provisions, than to the want of fresh vegetables and fruit. But it is unnecessary to pursue this part of the subject any further.

50. Dr. Lind states that scurvy most commonly occurred on land in persons who subsisted chiefly on dried, or smoked, or salted flesh or fish, and the unfermented farines; or upon bread made of peas, or a composition of peas and oatmeal. Kramer states that, in his time, this distemper appeared most frequently among those who lived altogether on boiled pulses, without any green vegetables or summer fruits. The occurrence of the disease among the Russian troops, whose chief food was rye-bread and meal, has been already noticed. Scurvy appeared among the inmates of a lunatic asylum in India, whose food consisted chiefly of rice and split peas; and Mr. Macolmson mentions the occurrence of the distemper in the same country among prisoners kept on bread and water. That various kinds of bread, especially when long kept, will occasion scurvy, or at least not prevent it, I believe, when they are not accompanied with succulent vegetables or fruits. But something is also owing to insufficiency, as well as sameness of diet, to living in a state of confinement, to breathing the air of the same place or habitation, and to the duration of this state of confinement: for it has always been remarked, that when this latter cause has been concerned in producing the disease, the first cases have been those longest confined. It may also be noticed, that the influence of farinaceous food in occasioning scurvy, is great in proportion to the length of time the articles have been kept previously, or subsequent to their usual modes of preparation, and to their healthy, or ripe, or untainted condition when predared. And it should be recollected, that flour, if sound and fresh, is more likely to prove beneficial when baked or otherwise prepared, shortly before it is used, than when it has been made into bread or biscuits a long time previously.

51. The prevalence of scurvy during 1847 and 1848, in Ireland, Scotland, and some parts of England, was very generally ascribed to the failure of the potato-crop. But in some places in Scotland, Dr. Christison imputed the disease to the privation of milk — an opion which has been negatived by numerous observations of the prevalence of scurvy where the supply of milk was abundant.

52. VI. The Nature of Scurvy may be inferred, with tolerable accuracy, especially as respects every practical purpose, from what has been adduced. But it is obvious, that the numerous occurrences of the distemper, both on land and at sea, as described at least by the majority of the writers referred to in the *Bibliography*, were associated with the appearance of one or more of those maladies, of which I have pointed out the relations with scurvy (§ 27. *et seq.*); and that, with many cases of scurvy, both simple and complicated, others of a different nature, as psoriasis, and various chronic eruptions, also appeared. To these circumstances,— to the extended signification thus imparted to the name, as well as to the complications it actually manifested,— are to be ascribed the diversity of description, and the numerous and complicated subdivisions of the malady, contained in works upon it during the 17th and 18th centuries. Opinions as to the nature or proximate cause of scurvy were no less diversified, and even numerous. Without attempting to adduce these opinions in full, or to connect them with their authors, it may be briefly remarked, that they generally agreed with the pathological doctrines of the day in which they respectively appeared, and were assigned by their authors, without any satisfactory proofs—were mere suppositions, or, at best, inferences from loosely-observed phenomena. Whilst some writers imputed scurvy to an acid state of the blood, others ascribed it to an alkaline condition of this fluid, and some even, to make more sure of the fact, considered that acidity in certain cases, and alkalinity in others, were its actual causes, the predominance of either condition giving rise to the different forms of the malady. These views not proving satisfactory, especially to those who had opinions of their own to propose, the existence of a predominant saline condition of the blood was supposed and accredited by many. But the particular salt was never shown, some considering it to be an acrid salt, others a rancid salt, and so on. Then came a viscid state of the blood to be asserted, then a vitiated as well as a viscid condition, and even the existence of a putrid ferment in the blood to be inferred. More recent writers considered that a simple dyscrasis of the blood only existed; others, not content with the simplicity of this view, thought it necessary to impart to it some special property or chemical quality, and contended that the dyscrasy was acid; and some were positive as to the dyscrasy being alkaline. Lastly, we find the distemper referred to the existence of a dyscrasis produced by the evolution of an acid ferment in the blood; the chief reason for the existence of this ferment being that an alkaline ferment could not exist; but the particular acid was not shown.

53. The chemical pathologists of the present day have not thrown much more light upon this part of the subject than their predecessors, each of whom considered his opinion as good as the former believed their own to have been. Dr. Christison supposes that scurvy arises from the want of vegetable albumen or animal casein in the food; and Dr. Garrod believes that the malady is caused by the absence of potash, and that potatoes, and other antiscorbutics owe their virtues to the potash they contain. Dr. Aldridge contends for the influence which should be ascribed to a deficiency of phosphorus, sulphur, lime, and the alkalies, in occasioning scurvy. That something may be owing—a part merely—to the causes contended for by Dr. Aldridge is not improbable. But it is unnecessary to pursue this subject any further than very briefly to state, that one of the most evident changes from the healthy condition is seated in the blood; but that this change is probably not the earliest in the procession of morbid phenomena, as it most certainly is not the only or the most advanced. That the change of the blood is, manifested by the sensible or physical properties, as well as by the chemical constitution of this fluid, will readily be admitted; and that, in consequence of this change, the several solids of the body are more or less affected, will also be conceded; but I contend that these are not the only alterations; for the vital qualities of the blood itself are more or less altered, or rather impaired,— those vital qualities which the blood derives from the organic nervous system, through the medium chiefly of the vessels in which it circulates. That the organic nervous system is early affected, either primarily, or through the medium of the blood, or in both modes, is shown, not merely by the functions, but also by the vital cohesion and organization, of the viscera and tissues which this system supplies and vitally actuates. But it is immaterial whether this system or the blood be the part primarily affected; for there can be no doubt that morbid states of the chyle, occasioned either by the nature and quality of the aliments, or by the defect of certain elements consequent upon the want of the requisite vegetable productions, or by both causes conjoined, will affect the assimilating functions, both by impairing organic nervous power, and by altering the constitution of the blood; the slow and gradual progress of these changes giving rise to all the structural, as well as functional alterations characterising the advanced stages of the malady.

54. VII. The Prevention of Scurvy.—*A.* The efficacy of *limes*, *lemons*, *shaddocks*, *oranges*, and *pomegranates*, in preventing scurvy, was known to several of the earlier writers on the disease, one of whom is quoted by Lind, in proof of the use thus made of these fruits by the Dutch seamen. Rousseus, Albertus, and other writers in the 16th century, make particular mention of lemons and oranges for the prevention and cure of scurvy. Although particular and convincing proofs of the efficacy of these were thus early furnished, not only by the Dutch, but also by some of our own early navigators, and subsequently by Admiral Wager, and others, insufficient attention was paid to the use of these fruits until the appearance of Dr. Lind's celebrated work on scurvy, at the middle of the last century. Notwithstanding the evidence so conclusively adduced by this able writer, these means of preventing scurvy were nevertheless more or less neglected, or were left to the caprice or choice of commanders and others, until the

efforts of BLANE, BLAIR, and TROTTER, towards the end of that century, succeeded in procuring the adoption of lime-juice for the naval service. The lemon and lime juice now supplied to the navy, is preserved by the addition of one part of strong brandy to ten of the juice. But when the fruit can be procured, it is generally preferred, and is used, especially when it is actually required, with much pleasure and relish.

55. *B.* Other *fruits*, particularly those of an *acid nature*, and even the *sweet fruits* before they are ripe, are more or less efficacious in the prevention and cure of scurvy. Dr. TROTTER states that, having remarked that scorbutic slaves threw away ripe *guavas*, while they used the green fruit, he resolved to try the effects of such. He selected nine negroes, equally affected with scurvy. To three of those he gave limes, to three green guavas, and to three ripe guavas. They were served by himself; and at the end of a week, those who were restricted to the ripe fruit were nearly as before the experiment, while the others were almost well. M. FODÉRÉ states, that the good effects of *unripe grapes* were very apparent in the scorbutic cases in the French army of the Alps, in 1795. Sir J. PRINGLE recommended *apples* as a preventive in 1776; and Dr. TROTTER remarks that, "when Lord BRIDPORT's fleet arrived at Spithead, in September, 1795, almost every man in the fleet was more or less affected with scurvy. Large supplies of vegetables were provided; and lemon-juice being scarce, in consequence of the previous great consumption, fifty baskets of unripe apples were procured for the use of the fleet. The *Royal Sovereign*, in particular, derived great benefit from them;" and the cure of the disease was every where most speedy. *Tamarinds*, and most of the acidulous fruits of warm and hot climates, are more or less anti-scorbutic. When scurvy was prevalent among the troops at Rangoon, during the Burmese war of 1824, the *Phyllanthus emblica*, or amla, which has a rich, acid taste, was employed as an anti-scorbutic with much benefit.

56. When BACHSTROM asserted, in 1734, that scurvy was the result of a more or less protracted privation of fresh vegetables and fruits, he stated at the same time both its prevention and its cure; and although certain vegetables and fruits accomplished these purposes more quickly and fully than others, all those which are edible possess more or less of these beneficial properties. The writers of the 16th century have generally noticed the popular use of *scurvy-grass*, *brook-lime*, *water-cresses*, &c., for the prevention and cure of this distemper. All succulent vegetables and plants comprised in the order *Cruciferæ*, are more or less efficacious, especially the *radish*, *horse-radish*, *turnip*, *carrot*, *cabbage*, &c.; and even such of these as are commonly only used when boiled, are most efficacious when taken raw and fresh from the ground. Dr. LIND very justly insists upon this circumstance, and remarks that herbs in form of salads, are more efficacious than when boiled; and that their anti-scorbutic properties are destroyed by drying, as shown by KRAMER, and by the results observed from the anti-scorbutic herbs sent from Vienna to the army in Hungary. *Onions*, *garlic*, *leeks*, and *potatoes* are all very decidedly anti-scorbutic, and as these may be preserved for some time, they are most beneficial for the provisioning of ships or armies. The very general use of potatoes in modern times, partly accounts for the remarkably less prevalence of scurvy at the present day than formerly.

57. Most of the articles which are anti-scorbutic, may be preserved by *pickling*, especially by the pyroligneous acid or vinegar, and retain in a great degree their virtues. The immunity of Dutch vessels from scurvy has been ascribed by Dr. KERR and others to the use of *sour krouts*; and the health of the crew of the *Centurion*, during Captain COOK's voyage, was considered to have been owing to a liberal supply of this anti-scorbutic.* The quantity usually allowed of this substance was two pounds' weight to each man per week, besides a pound and a half, or two pounds, with every gallon of peas, for making soup.

58. There is no northern country where scurvy is generally endemic during winter, spring, and the early part of summer, that does not furnish a supply of anti-scorbutics, if duly recognised and preserved for these seasons. In Norway, Greenland, Iceland and Lapland they employ *scurvy-grass*, *sorrel*, and various other warm and acid herbs. Sir E. PARRY, in his first polar expedition, experienced the advantage of sorrel in the cases which occurred among his crews. He states that sorrel was preferred by the Esquimaux to scurvy-grass. He adopted also the advice of BACHSTROM and LIND, and raised small quantities of *mustard-and-cress* in his cabin, in small, shallow boxes, filled with mould, and placed along the stove-pipe; and as much of these were thus produced, although etiolated from want of light, as to prove beneficial to the scorbutic cases.

59. *C.* There is, perhaps, not any vegetable production more remarkably anti-scorbutic than the tribe of *firs*, especially the spruce-fir and common fir, and mountain-pine. MOELLENBROEK states, that when the Swedish army, at war with the Muscovites, were attacked with scurvy, Dr. ERBENIUS prescribed a *decoction of fir-tops*, by which the most deplorable cases were cured, and the rest of the troops protected from the distemper. Two squadrons of ships fitted out by Russia in 1736, were obliged to winter in Siberia, and their crews became affected with scurvy. After attempts to discover a remedy, the pines which grew plentifully on the adjoining mountains were hit upon; and by these all the men recovered in a few days (GMELIN, *Flor. Siber.*, p. 181.). Dr. LIND remarks, that pines and firs, as well as the shrub called the black spruce, have all analogous medicinal virtues, and great efficacy in the prevention and cure of this disease. "A simple decoction of the tops, cones, leaves, or even green bark and wood of these trees, is an excellent anti-scorbutic: but it becomes much more so when fermented, as in making spruce-beer, where the *molasses* contri-

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* Dr. KERR, in his able treatise on scurvy, remarks, that "Sour kroute or croute (*sauer kraut*, Germ.) is prepared by slicing the soundest and most solid cabbages in the way cucumbers are used in this country. In this state they are put into a barrel in layers, hand high, and over each is strewed a handful of salt and carraway seeds: in this manner it is rammed down, stratum supra stratum, till the barrel is full, when a cover is put over it, and it is pressed down with a heavy weight. After standing for some time in this state, it begins to ferment; and it is not until the fermentation has entirely subsided, that the head is fitted to it, and the barrel is finally shut up and prepared for use."—*Cyclop. of Prac. Med.* vol. iii. p. 691.

butes, by its diaphoretic quality, to make it a more suitable medicine. By carrying a few bags of spruce to sea, this wholesome drink may be prepared at any time. But when it cannot be had, the common fir-tops should be first boiled in water, and the decoction afterwards fermented with molasses, in the common method of making spruce-beer, to which a small quantity of wormwood and horse-radish root (which it is easy to preserve fresh at sea) may be added."

60. *Tar-water* was formerly strongly recommended as an anti-scorbutic; but the extravagant praises bestowed upon it at the commencement of the last century, greatly injured its just reputation. Dr. Lind still continued to uphold it; and many years ago, I had occasion to have recourse to it as a preventive, when placed in circumstances most likely to occasion this distemper, and when no other means could be obtained.* There are many reasons to believe, that all the *terebinthinates* are anti-scorbutic; and that, when the disease is attended by hæmorrhage, there is no substance so efficacious as the spirit of turpentine, when taken in small and repeated doses, in arresting the hæmorrhage, in restoring the tone of the extreme vessels, and removing the contractions of the joints. With this impression, I recommended Sir E. Parry to have a supply of this medicine in his last polar expedition; and he adopted the recommendation. The *anuda tree*, to which Cartier attributed the remarkably quick recovery of his crew, is considered by Lind to have been the leaves and tops of the American spruce; and it, as well as the other pines and firs, evidently owed much of its virtues to the terebinthinate principles it contained.

61. *D. Molasses* have been considered by Lind and others as anti-scorbutic; and Sir G. Blane states, that the ship in which it was first tried, was the only one in the squadron that was free from scurvy, which prevailed so much in the other ships, that, on their return to Portsmouth in August, 1780, 2400 men were sent to the hospital with this disease. Subsequently, molasses was served with rice to the men who were scorbutic, or threatened with scurvy, in Lord Howe's fleet; and the benefit derived from it was so great, that it was made for some time a regular article in the victualling of ships. Nevertheless, the malady was not entirely prevented; and in some vessels well supplied with it, scurvy prevailed to a great extent. Dr. Budd believes, that the anti-scorbutic properties of sugar-cane are greater than those of molasses; and that they are much impaired by the process employed in the manufacture of sugar. I consider this opinion to be correct, from what I have observed in warm climates.

62. An anonymous work on scurvy, published in 1767, recommended the use of *wort*, or an infusion of malt, as an anti-scorbutic; and this substance was afterwards favourably noticed by Dr. Badenoch. Captain Cook employed it in the *Centurion*, and spoke highly of its efficacy. He took with him a large supply of malt, with which to make wort; of this from one to three pints were given daily to each man. Sir G. Blane states, that the fleet in the West Indies was supplied with the *essence of malt*; that it proved of service, but that its anti-scorbutic properties were inconsiderable. The process of extracting the essence very probably impaired the properties possessed by the infusion.

63. *E. Various fermented liquors* have been used as anti-scorbutics, some of them from times immemorial, in northern countries. In Norway, in the Feroe and Shetland Isles, the inhabitants have, from the earliest ages, used, as their common beverages or drink, two kinds of fermented liquors; the one consisting of the fermented serum of butter-milk, or of fermented butter-milk, the caseous matter being removed as the fermentation proceeds; the other being an infusion of the bran or husks of oats and barley, that is fermented after the chief part of the farinaceous deposit from the infusion is removed. This deposit takes place from the infusion after this latter is poured off, or otherwise separated from the bran or husks. The infusion is then allowed to ferment, and the farinaceous deposit is removed, and used as an article of diet. These are very agreeable beverages, especially during the advanced stages of their fermentation, and constitute the common drink of the inhabitants. They are the chief means of averting scurvy in these parts, where fresh vegetables are either scarce, or not to be obtained, during a great part of the year, and where fruits are almost altogether wanting.

64. In all the continental countries bordering on the Baltic, and Northern and German oceans, *spruce-beer* is the most generally and most efficaciously used as a preventive of scurvy; vessels from Denmark, Sweden, Holland, Riga, Dantzic, &c., being generally provided either with it or with the essence of spruce, for their anti-scorbutic properties. Spruce-beer is beneficial, not only for the prevention and cure of scurvy, but also in the treatment of most fevers of a low type, and of several cachectic diseases; in all of which I have, since the commencement of my practice, frequently prescribed it. As shown above (§ 59.), it may be readily prepared from the materials which are easily procured, and as easily carried about. *Cyder* and *perry* are amongst the most decided anti-scorbutic beverages in use in this country, and were long ago shown to be very serviceable by Sir J. Pringle and Dr. Lind. *Small-beer*, in a state of brisk fermentation, is also anti-scorbutic, especially when a sufficient quantity of hops, or of a vegetable bitter, has been added. Sir G. Blane and others have made a favourable mention of *malt-liquors*, and I have seen them used with advantage, especially *porter*, when bottled and well preserved.

65. The several kinds of *wine* are more or less

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* The author of this work, in the winter of 1817 and 1818, was a passenger to England in a vessel, which was detained by bad weather at sea during thirteen weeks and four days, and which was provisioned and watered for seven or eight weeks only. He fortunately had laid in a small stock of articles for his own use; but, nevertheless, it was found necessary, after some time, to place every one on an abridged allowance of food and water. The meat provisions were altogether long salted, and were chiefly pork; the biscuit was coarse and mouldy. The water ultimately also was short in quantity, turbid, bluish, and most offensive. There fortunately was a very moderate supply of potatoes. During thirteen weeks no land had been seen, nor any other vessel communicated with. In this predicament —which, however, was not the only or the most dangerous one,— the author caused a small quantity of *tar* to be put into the water before it was used for drinking, and a little spirit was added. To these means, aided by a very moderate supply of potatoes, he attributed the preservation of the crew from scurvy and scorbutic dysentery, every person arriving in the Downs in good health notwithstanding the unwholesome supply of food and water, and the unfavourable season.

anti-scorbutic; and they are rendered still more so by the addition of vegetable bitters and aromatics, more particularly absinthium, calumba, cascarilla, ginger, orange and lemon-peel, &c. It has been observed that scurvy was rare in French ships of war in which the wines of their country were served out to the crews. Sir G. BLANE, Dr. LIND, and Dr. BRYSON agree in reprobating the use of spirituous liquors. There can be no doubt of the injurious tendency of these when taken in excess, or habitually, or undiluted. But used in small quantity, largely diluted, and added to the more common anti-scorbutic beverages, or to bitter vegetable infusions, they are decidedly beneficial, both in the prevention and cure of the distemper. There are various contingencies which occur to voyagers, requiring a cautious and moderate recourse to one or other of these liquors; and, in circumstances threatening the outbreak of scurvy, the addition of a small quantity of either of them to the means of prevention in common use, has a very beneficial influence upon the spirits and constitution of those who thus abstemiously use them, and promotes the good effects of the more efficacious anti-scorbutics, especially during exposures to cold and humidity.

66. *Vinegar* was early employed as an anti-scorbutic, and our fleets were generally supplied with it during the last century. Dr. LIND, Sir G. BLANE, Dr. TROTTER, and others, have shown that the distemper prevailed in ships which were well supplied with this article. Much, however, depends upon the kind of vinegar employed. The pyroligneous acetic acid certainly possesses considerable anti-scorbutic properties; much apparently depending upon the source and the preparation of this article. Dr. BUDD remarks, that he has observed scurvy in ships well supplied with vinegar; but the disease, in its most aggravated form, has appeared amongst those crews which had no regular allowance of this article.

67. *F.* The *mineral acids* have been found but little influential in the prevention and cure of scurvy. Dr. LIND took twelve patients on board of the *Salisbury*, at sea; their cases were quite similar. They lay in one place, and the diet was the same for all of them. Two of them were ordered a quart of *cyder* daily; two others took twenty-five drops of *elixir of vitriol* three times a day; two had two spoonfuls of *vinegar* thrice a day, and their food well acidulated with it; two were put on a course of *sea water*, about half a pint having been given every day; two had each two *oranges* and one *lemon* daily; and two had the size of a nutmeg, three times a day, of an *electuary* made of *garlic*, *mustard-seed*, *rad. raphan.*, *balsam of Peru*, and *myrrh*; using barley-water, acidulated with *tamarinds*, for drink. The oranges and lemons were the most speedily beneficial; next to those the cyder: those who took the other medicines were, at the end of a fortnight, much in the same state as those who had taken only lenitive electuary and cream of tartar as an aperient.

68. *G.* There are numerous medicines besides those already mentioned, which are more or less useful in preventing as well as in curing scurvy. Most of the more *succulent* and *acidulous* vegetables, plants, and fruits, especially when fresh, or preserved by pyroligneous vinegar, are beneficial; but many of them lose their anti-scorbutic virtues when dried, and others when boiled. Of the medicines which may be used, and which are certainly occasionally serviceable, even when other means have failed, I may mention the *chlorate of potash*, *nitrate of potash*, *camphor*, the *chlorides*, *lime-water* and the *chloride of lime*, *chlorine*, *chlorinated water* and *chlorinated soda*, *sarsaparilla*, *serpentaria*, *sassafras*, *capsicum*, *taraxacum*, *guaiacum*, *mezereon*, *senega*, *elm-bark*, *dulcamara*, the several *balsams*, &c.; but these are severally only of use for certain modifications and complications of the malady.

69. It has been frequently supposed, and the supposition too often acted upon, that *fresh meat* is of itself sufficient to prevent or to cure scurvy when it breaks out in ships, and this opinion may supersede the opportunity of procuring fresh vegetables and fruits. Dr. BUDD states, that during the year in which he wrote on this disease, "the captain of a vessel trading to the Mauritius furnished his men, while they stayed at the island, with a plentiful supply of fresh beef, procured at considerable expense, but neglected to provide them with vegetables and limes which abound in the island. The consequence was, that scurvy broke out soon after they set sail, and before the ship arrived in this country one half the men before the mast had died of it, and the rest were disabled." (p.77.)

70. *H.* It is not alone requisite to use the above means of prevention, as they may severally be possessed by individuals or communities, under circumstances which render the appearance of scurvy either probable or certain; but all the *predisposing and exciting causes* (§ 33. *et seq.*) *ought to be carefully avoided*, as far as this can be effected. I believe that no mean cause of the prevalence of scurvy in the navy, as well as in trading ships, was the habit, morning and evening, of washing the decks, thereby keeping in a constant state of humidity and evaporation, and the air either cold and humid, or close and humid, according to concomitant circumstances. This evil is partly abated by adopting dry scrubbing and similar means; but it still should be kept in recollection, as the adoption of it depends upon the knowledge or caprice of the captain, who in this, as well as in other matters connected with naval service, may, thus occasion an unhealthy state of air, an artificial malaria, the humidity favouring the concentration of emanation from the hold and other parts of the ship, and from the individuals confined during the night in a limited space and in a close air. Harassing duties, fatigue, and whatever lowers the general standard of health, or depresses the vital powers, ought also to be avoided.

71. *I.* Much, as will be seen from the above, depends upon the victualling of ships, especially those which proceed upon long voyages. The sailors should have a sufficient supply of cocoa, tea, coffee, fresh lemon-juice, sugar or molasses; and whilst spirituous liquors are allowed, in very moderate quantity, and only when wet or fatigued, they should either be withheld, or allowed in very small quantity only, when these exigencies do not exist. In circumstances tending to depress the mind, endeavours should be used to amuse and to excite it, in such ways as may the least tend to be followed by any depression. In these respects, as well as in others, the means adopted by Sir E. PARRY deserve both praise and adoption, as far as the latter is possible.

72. VIII. **TREATMENT OF SCURVY.**—What has already been stated with reference to the *prevention* of scurvy, applies equally to the *treatment* of it, especially in its early stages, and less complicated or less severe states. But it is occasionally observed, that, owing either to the continued influence of certain causes which are overlooked, or cannot be removed, or to the presence of some complication, the disease resists the usual means of cure, and even those remedies which have generally been efficacious in the most severe cases. *Lime-juice*, and especially fresh *lemons* and *limes*, have been found the most efficacious means of cure in pure scurvy; but instances have been recorded very recently, in which lime-juice has failed. These instances of failure have, however, been adduced in too general terms, and without a sufficient and precise record of the several circumstances in which the failure occurred, or of the particulars in which the disease varied in its character from that usually observed. The distemper has commonly been stated to have been scurvy arising out of the usual causes; and lime-juice has been said to have been given without benefit; but no particulars are adduced as to the existence or non-existence of one or more of those predisposing and concurring causes described above (§ 33. *et seq.*), as not merely contributing to the production of the malady, but also actually perpetuating, modifying, or aggravating it, if they are allowed to continue in operation during the treatment. When lemons, limes, shaddocks, and oranges can be procured, they are preferable to other means; but, otherwise, the preserved lime-juice, or crystallised citric acid, should be substituted. In respect of the preserved juice, we have no adequate information as to the time it will retain its anti-scorbutic properties; for it is not unreasonable to infer, — indeed it has been proved — that, when this juice has been kept two or three years, as is not infrequently the case, it may have lost much of its virtues, the failure of it under such circumstances being sufficiently evident, without looking for the cause of failure in the nature of the disease itself, or in the inefficacy of the remedy.

73. One of our oldest English writers on scurvy, JOHN WOODALL, in his meritorious work entitled the "Surgeon's Mate,"—a name too vulgar to be noticed by doctors of modern manufacture,—observes that "we have many good things that heale the scurvy well on land, but the sea chirurgeon shall do little good at sea with them, neither will they endure. The use of the juyce of lemmons is a precious medicine, and well tried; being *sound and good*, let it have the chiefe place, for it well deserves it; the use whereof is: it is to be taken each morning, two or three spoonfulls, and fast after it two hours; and if you add one spoonful of *aqua vitæ* thereto, to a cold stomach, it is the better. Also, if you take a little thereof at night, it is good to mixe therewith sugar, or to take of the syrup thereof is not amisse." This good advice was given in 1636, and further insisted upon subsequently, by MARTIN LISTER, DELLON, and many others; and yet when Lord ANSON proceeded on his circumnavigation, no provision of the kind was made against scurvy; the prevention and cure of disease, and rewards for those who devote themselves to those laudable undertakings, never having been considered of any importance by British Governments, or, at least of very minor importance only; the aggrandisement of party and family connections always absorbing and utterly annihilating considerations of public justice and patriotism.

74. Since the works of LIND, TROTTER, and BLANE established the reputation of lemon-juice and acidulous fruits, for the cure of scurvy, these, with the use of fresh succulent vegetables, have been generally adopted. Nevertheless, other means have been resorted to, owing either to the failure of the lemon-juice, or to the form of, and circumstances attending, the malady. The other vegetable acids, and the mineral acids, have been found very remarkably inferior to the citric in the treatment of scurvy; but the amount of benefit which various kinds of salts, and the alkaline carbonates, are capable of affording, has not been ascertained, excepting in the single instance of nitre. Mr. PATTERSON, a naval surgeon, writing in 1794, showed the good effects of a solution of *nitrate of potash* in *vinegar*. He advised four ounces of nitre to be dissolved in a quart of vinegar, and gave half an ounce of this solution twice or thrice daily, and bathed the local sores with it as often. He states, that "some patients cannot bear the solution without the addition of water, whilst others, without the least inconvenience, bear it undiluted. The discharges by stool, or the presence of gripes or nausea, guide me with respect to increasing or diminishing the dose; but, at the same time, it is not a slight degree of nausea, colic, or diarrhœa that renders an alteration in the quantity of the medicine necessary. To a great number of scorbutic patients, eight ounces of this strong solution, containing one ounce of nitre, have, in the course of the day, as long as such a quantity was necessary, been administered to each with the greatest success. Also, large and frequently-repeated doses of this medicine have been given in cases of scorbutic dysentery, and instead of increasing, I have always found it remove the disease."

75. Mr. CAMERON, another experienced naval surgeon, states, that having on several occasions observed the excellent effects of a solution of nitre, as recommended by Mr. PATTERSON, in scurvy, he was induced to employ it when the disease broke out among the prisoners on board of a convict-ship proceeding to Sydney in December, 1829, under his care. As soon as he commenced the use of this solution, many almost hopeless cases began to improve rapidly, and before one third of the voyage was accomplished, the health of the sick improved so fast under the new treatment, that he did not think it necessary to go into any port; and the general health of the prisoners (216.), when they arrived at Sydney, was much better than when they embarked in Ireland. Some of the cases manifested a severe pulmonary complication, but these also recovered. Mr. CAMERON's preparation consisted of eight ounces of nitre, dissolved in sixty ounces of vinegar. Sometimes equal parts of vinegar and lime-juice were used: a little sugar was generally added, to render it more palatable, and a few drops of oil of peppermint, and a little alcohol. An ounce of this solution was a dose; and from three to eight doses, according to the stage and severity of the disease, were given at equal intervals, from six in the morning until eight at night.

76. It has been contended by Dr. Stephens, that the state of the blood in scurvy indicates the exhibition of the non-purgative salts, and not of acids. His own experience appears not to have furnished him with sufficient evidence in this matter. But I may mention, that in states of disease closely allied to scurvy, I have given, from an early period of my practice, the *chlorate of potash*, as well as the *carbonates of soda* and *potash*, with very marked benefit. In obstinate or complicated cases, or when the above means fail, a combination of these salts — of the nitrate and chlorate of potash, and the carbonate of soda or potash — may be tried; or the *chlorinated solutions of lime* or *of soda*. When diarrhœa is present, *lime-water* with milk, or small and frequent doses of the *chloride of lime*, or of *creasote*, in any demulcent vehicle, may be of use; and when hæmorrhages are present, small or moderate doses of the *terebinthinates*, or of the *spirits of turpentine** (§§ 69, 60.), should be exhibited in any suitable form, or on the surface of spruce beer, when that beverage can be procured.

77. When the disease is *complicated* with *pleurisy*, or with *congestive pneumonia*, the nitre, with lime-juice and camphor, will be found beneficial; and epithems or embrocations applied to the chest or over the seat of pain, consisting of the compound camphor and turpentine liniments, will prove of essential service. When the disease is associated with disease of the *spleen*, as often occurs when it follows *intermittent* or *remittent fevers*, the preparations of cinchona or quinine, of serpentaria, guaiacum, &c., have frequently been found of service. In these, as well as in complications with *ague*, the remedies just mentioned should be exhibited in decided or sufficient doses; or various chalybeate preparations may be substituted, or given as circumstances may suggest. If the functions of the *liver* be torpid, or if congestions of this organ or of the spleen be indicated, the *nitro-hydrochloric acids* may be taken in weak solution, as the common drink, and the surface of the trunk, or the lower extremities sponged or bathed with the tepid or warm solution of these acids. In many circumstances of the disease, the compound decoction of *sarsaparilla*, or other preparations of this medicine, will be taken with advantage; and several of the substances mentioned above (§ 68. *et seq.*) will be beneficially conjoined with others, according as circumstances arise.

78. During the course of scurvy, whether simple or complicated, the *bowels* are often more or less disordered. When *costiveness* occurs, it should be removed by the less irritating but efficient means. The most appropriate, and the most successful, is a solution either of the *citrate of magnesia*, or of the *phosphate of soda*; or a sufficient quantity of *magnesia*, taken shortly before exhibiting the lemon-juice or the solution of citric acid. In order to keep the bowels sufficiently open, and to procure a return of the functions of the skin, magnesia may be taken conjoined with the precipitated *sulphur* and a little powdered ginger, in repeated doses. If *diarrhœa* or *dysentery* supervene, the means already mentioned, or those advised in another place (see Dysentery, Scorbutic), should be employed. If the evacuations be very offensive, as well as frequent, lime-water with milk, or the chloride of lime, or powdered charcoal, or tar-water, or creasote, will be found very beneficial; and to either of these, the calumus aromaticus, or other similar substances, may be added. M. Brachet states, that he has cured several cases of scurvy with powdered carbon alone.

79. As the disease approaches to, or assumes the characters of *putro-adynamic* or *maculated fever*, as observed sometimes under circumstances favouring this occurrence, the remedies advised above (§ 68.) for the complication of the distemper with ague; and various antiseptics, especially those recommended for the treatment of putro-adynamic or typhoid fevers (see Fevers, § 585. *et seq.*), should be prescribed with due decision, and appropriately to the features of individual cases. In all the states or complications of scurvy, as in low states of fever, approaching in character to those of scurvy, an *expectant practice* is not only a most dangerous, but a fatal one. The medical journals of the day — the middle of the 19th century — teem with the histories of cases of low fever, in which the practice was either expectant or inappropriate, as far as the treatment is recorded; the *post-mortem* changes revealing the results, which, by the experienced and observing physician, may have generally been anticipated.

80. The *diet* and *regimen* during the course of the malady, constitute the chief part of the treatment, and, as such, have been sufficiently noticed, in respect both of the prevention and cure of the malady. A warm, dry, and pure air (avoiding exposure to cold and wet) and moderate mental excitement, amusement, &c., will contribute very remarkably to the removal, as well as to prevention of scurvy.

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* Very recently the spirits of turpentine has been recommended for hæmorrhages, as a new medicine for this class of diseases. I may mention, that, in a memoir, with experiments on the use of this remedy in disease, published by me in 1821, in the *London Medical and Physical Journal*, it was strongly advised to be prescribed for all hæmorrhagic affections; and the same advice has been given for these affections, as well as for numerous others, in this work.

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SEROUS and SYNOVIAL MEMBRANES.

Synon. — *Membranes séreuses*, Fr.: — *Seröse Haüte, S. Ueberzüge, Wasser-haüte*, Germ.; — *Membranes Synoviales*, Fr.; — *Synovial-kapseln, Synovial-haüte*, Germ.

Classif. — See *art.* Peritoneum, Pleura, &c.

1. The *pathology* and *diseases* of *Serous* and *Synovial membranes* have been so fully considered in the *articles* Peritoneum, Pleura, Brain, Membranes of, that a description of the *organic changes* presented by these membranes would be only a repetition of what has been already stated under these heads. As respects these changes, whether those consequent upon the several states of inflammation, or those arising from constitutional causes, or vice, and altogether independent of inflammation, I believe that they will be found to be more fully described, at the places now referred to, than anywhere else. Since these articles were written, the very excellent works of Rokitansky, and the able treatise of Dr. Brinton on the pathology of serous and synovial membranes have appeared; but after attentively perusing these, I find nothing that requires to be added, at this place, by way of appendix to the articles just enumerated. Indeed, there is one lesion, or rather ultimate change, consequent, in rare instances, upon *chronic peritonitis* and *chronic pleuritis*, lately seen by me in these maladies, which is not noticed by either of these writers, namely, the complete degeneration of the greater part of he organised exudation, false membranes, or adhesions produced by these diseases, as well as by chronic inflammation of the serous membrane of the spinal marrow, into fat. This ultimate change, observed by me in these three situations, in old, or very chronic cases of these maladies, appeared to be not merely a far-advanced change, but also a reparative one, admitting of a partial return of the functions of the parts adjoining (see *art.* Pleura, § 100.).

2. The contractions also produced in cases of chronic inflammation of the peritoneum, described by Dr. Hodgkin and myself, have also not been mentioned by these writers. (See *art.* Peritoneum, § 116.)

3. It is almost unnecessary to state, that the organic changes met with in the membranes usually denominated *serous*, occur also in those commonly termed *synovial*, their intimate structures being alike, although their connections are different.

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SHOCK, VITAL or NERVOUS.

— Synon. — *Sudden sinking of Vitality*; — *Vital Depression*; — *Nervous Shock*, — *Nervous Depression*, — *Fatal Sinking, &c.*

Classif. — I. Class. I. Order (*Author*).

Definit. — *Sudden or instantaneous depression of organic nervous, or vital power, often with more or less perturbation of body and mind, passing either into reaction, or into fatal sinking, occasioned by the nature, severity, or extent of injury, or by an overwhelming moral calamity.*

1. A *shock*, whether physical or moral, may present any grade of severity, from merely a slight but sudden depression of the vital functions, to the rapid extinction of these functions. From its slighter forms, the powers of life react sooner or later, especially when judiciously aided; but its more intense states are either removed with great difficulty, or they proceed, with various rates of celerity, to a fatal issue; the vital sinking increasing more or less rapidly, and extending from the organs more strictly vital to all other parts, — from the seat of injury to the solar ganglion, and thence to the heart, respiratory apparatus, brain, spinal chord, muscles, and senses, — until the functions of all are extinguished. *Vital shock* varies, not only in severity and fatal tendency, but also somewhat in its phenomena, according to the constitution and vital energies of the sufferer, and the nature of the cause.

2. Although the effects of shock have been recognised by most observing persons, even by the uneducated, yet they have received extremely little attention from medical men; they have not been noticed, either in medical or in surgical writings, excepting very casually in some surgical works; and I believe that they are now treated of for the first time in a systematic medical work.[*] It is necessary to distinguish *shock* from *concussion*; for although concussion, whether of the head or of the spine, is generally attended with more or less of vital shock, still concussion concerns chiefly the functions of either the brain, or spinal chord, or of both, according as the injury is directed to either or both of these quarters. The severity and danger of shock depends, not upon the amount of pain produced, but rather upon the suddenness and violence of the injury, relatively to the amount of vital resistance; for when a cannon-ball, or any other ball, carries off a limb, or does other fatal injury, pain is not produced, but the vital shock is extreme, the general depression,

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[*] The diseases of the Cæcum and its *Appendix* were fully described, and their treatment pointed out in this work, long before they received any adequate attention elsewhere. Some years afterwards papers were published on that subject in the Transactions of the Medical and Chirurgical Society; and the learned author of these papers commenced with the veracious statement, that the subject had never engaged the attention of any previous writer, although the comprehensive article on the subject in this work is sufficiently extensive to make a small volume, and it was then in the hands of many thousand readers. It is to be hoped, that the present article may receive attention, but not quite similar attention, especially from Surgical readers, whom it more especially interests. "*Sic vos non vobis*," &c.

or vital sinking, often passing rapidly to dissolution.

3. Pain of itself rarely occasions, although it may accompany shock, and, when it does, it generally tends to diminish shock, and to develope reaction. Pain and shock are often associated in injuries and surgical operations; but the former is an endowment tending to the protection of life, to the counteraction of the effects of shock, and to the development of a salutary vital reaction. The severest or most prolonged pain does not occasion vital shock, but it causes vital exhaustion, sometimes even sleep. This was proved by the tortures of the rack in former times, and by the history of the most painful affections. When pain attends severe injuries and operations, the patient sinking more or less speedily, the result should be imputed to the influence of the shock on the constitution, and not to the pain, which is merely unavailing in counteracting the fatal result. This view of the subject, I am aware, is very different from what is generally taken; but a more intimate consideration of the phenomena, than has hitherto been entertained, will show its truth. The importance of this topic is remarkably heightened at the present day by the circumstance of anæsthetics being so generally employed during operations, and even during parturition; for if the view I now take be just, the shock to the constitution, or vital influence, by severe operations, or by a severe labour, will be increased by annihilating the preservative influence of pain; and the immediate, as well as the more remote effects of shock will be thereby more or less increased.

4. In the article, Poisons, I have shown the effects produced by the *inhalation of chloroform and æther* (§§615, 616.). It may be useful to view these effects in connection with those produced by dangerous or fatal injuries, and to contrast them as far as they admit of contrast. It will be seen, by observing the progressive effects of chloroform, that it paralyses sensibility, and subsequently, as its influence extends to the medulla oblongata, it more or less paralyses the respiratory functions, and ultimately the heart itself, if its inhalation be continued sufficiently long to produce this effect; the functions of the brain, of the medula oblongata, and of the ganglial system, being successively extinguished. The effects of fatal shock are similar as respects the sinking and extinction of the functions of these several organs, but they present a different order of procession, as will be more fully shown hereafter, the ganglial and cerebro-spinal functions being successively affected. Now, as the effects produced by the inhalation of chloroform are depressing as well as anæsthetic, and as shock is also depressing, although in a somewhat different manner, must it not be reasonable to infer, that the shock will be more severe and dangerous, cæteris paribus, during the influence or effects of chloroform, than when the frame is unaffected by this agent, and when pain exerts its influence, and developes a salutary vital resistance? In this matter, the ascertainment of truth is my object. I reason from my own observation, as far as it has extended, and I leave this part of my subject to those who have had, or may have, a more extensive experience of the phenomena to which these remarks apply.

5. Shock produces effects of various grades of severity, according to the health, or the states of depression or of excitement, the individual may be in at the time of sustaining it. Thus a person of a powerful constitution is much less affected by it than a delicate, nervous, or melancholic individual. A state of excitement, anger, passion, &c., to a certain extent, counteracts its effects, whilst fear, grief, or any of the depressing passions, increase its effects. Even pre-existing disorder, or structural change, renders these effects more dangerous or severe, especially organic change of the structure, or of the cavities or valves, of the heart. These are important circumstances as respects persons for whom severe operations may be required, and should be kept in recollection when such operations are about to be determined on. Whilst the *severity* of shock is thus influenced by constitution, temperament, states of mind, and existing disorder or actual organic disease, the *phenomena* constituting shock are also modified, by these circumstances, in a more or less remarkable manner. The intensity, as well as the modifications of the phenomena of shock, is very remarkably influenced, or even in great measure occasioned, by the state or amount of alarm produced in the mind of the sufferer by the injury causing the shock; this is the more remarkable in severe wounds and other injuries.

6. From these considerations, it will be readily inferred, that the *symptoms* or *phenomena of shock* will vary more or less in different cases, according as one or several of these modifying causes are in operation; and that, whilst certain of them may be wanting in some instances, the whole may be differently grouped, or may appear in varied succession, in most cases.

7. I. Phenomena of Shock. — The *symptoms* of shock vary with the severity or intensity, and nature of the *cause*, and the state or constitution of the recipient. — The *causes* of shock are chiefly, 1st, contusions, bruises, blows, and concussions; and these vary in their effects, according to their situation upon or near vital or important organs, as when they are seated over or near the epigastrium, the cranium or neck, the joints, the spine, &c. 2d. Gun-shot wounds, by which large nerves, blood-vessels, or important viscera, or joints, or large bones, are more or less injured. 3d. Penetrating or incised wounds, or surgical operations, implicating these or other parts. 4th. Simple or compound fractures, dislocations, lacerations, or lacerated injuries of all kinds; and 5th. Mental alarm or terror, or shocks from the sudden or unexpected intelligence of losses of near relations, of friends, of wealth, of honour, or of worldly consideration, or intense fear or dread of some calamity. In many of the preceding classes of causes of shock, mental alarm or dread — the mental shock — greatly increases the effects of the physical shock upon the vitality of the frame, and especially on the manifestations of life in the nervous system; so that in estimating the amount of the latter, care should be taken not to overlook the existence and intensity of the former — of the mental alarm or shock.

8. Now, although these several classes of injury, with their frequent attendant, mental alarm or shock, may be supposed to produce varied effects, yet such is not always the case; for so much may be owing to the severity, as well as the nature of the cause, relatively to the state and constitu-

tion of the sufferer, that the phenomena consequent upon the one class may hardly vary from those following the others. So much, however, is often observed to depend upon the viscera and parts injured, and upon the loss of blood, and the amount of that loss, as well as upon the intensity of mental alarm, as to render it necessary to connect the shock, and its intensity, with the nature and severity of the cause, or causes, which produced it. For, according to the cause, (1st) the shock may be altogether and simply a vital one, as when it is produced by a violent blow on the epigastrium, occasioning concussion of the solar ganglion; (2nd) or it may be associated with various nervous phenomena, as when a large nerve, or joint, or limb, is lacerated or severely injured, and the patient thereby greatly alarmed; (3rd) or it may be complicated with, or rather characterised by, comatose sinking, as when the contusion, concussion, or blow, affects the intimate organization and circulation of the brain; (4th) or it may be so associated with the sinking consequent upon losses of blood, as not to be distinguished from this cause, especially when the injury is such as occasions both shock and hæmorrhage; or (5th) the alarm or shock may be entirely a mental one, or that consisting entirely of the sudden effects of extremely depressing emotions on the action of the heart, or of the sudden and unexpected intelligence of distressing losses or events, whereby the nervous system is more or less shocked, the mental manifestations disturbed, and the functions of the heart and vital organs depressed and otherwise disordered.

9. It will thus be perceived, that the injuries or *causes* occasioning shock may be divided into *five classes*, and that the effects they produce may present *five modified forms*; but although either of these may result from either class of causes, and although it is necessary to connect, our observation of the phenomena, and our treatment of shock, with the particular cause of it, it is still more important, especially as regards the treatment, to mark the particular form and modification requiring our aid.

10. (*a.*) The *simple* or more *vital states* of shock may be so slight as to pass off in a few hours, or so severe as to terminate fatally in a few minutes, according to the intensity of the cause. This effect may be altogether independent of any hæmorrhage, and may result from a variety of causes. A violent blow or contusion over or near the epigastric centre, may so paralyze the heart, as to produce more or less sinking, not only of the action of this organ, but of all the vital functions; the *symptoms* being chiefly feebleness, slowness, or irregularity of the pulse; coldness and pallor of the face, general surface, and extremities; a distressing feeling of sinking and anxiety; slow or irregular respiration; sometimes cold perspiration, with general tremor; and a sunken or collapsed state of the countenance, terminating, more or less rapidly, in loss of pulse at the extremities and in the carotids, and in extinction of sensation, of the heart's action, and of respiration. In some cases, especially when the injury is less intense, or when a large joint is very severely injured, or crushed, these symptoms may not be so intense, may be of longer duration, and be attended by others, as vomiting, singultus, or by restlessness, by feelings of alarm and anxiety at the epigastrium; and, according to the nature and severity of the cause, relatively to the state of the sufferer, these symptoms may lapse into fatal sinking, or be followed by imperfect efforts at reaction, or by delirium, or by reaction, terminating ultimately either in coma and death or in recovery, according to the constitution of the patient, and the treatment adopted.

11. (*b.*) With more or less of the above symptoms, others may supervene, or may be present from the first, more especially when a limb is carried away by a cannon-ball, or when it is lacerated extensively, or near to the trunk of the body, or when large blood-vessels or nerves are lacerated, or large joints are crushed. In these circumstances, as well as in others, especially in nervous and irritable temperaments, various *nervous symptoms*, especially mental alarm and restlessness; irregularity of the heart's action and of respiration; a terrified, as well as a sunk state of the countenance; delirium, terror, and incoherence; a general tremor and coldness; a remarkable and peculiar tremor or quivering of the injured limb, with a cold, wet, pallid, or leaden state of the surface of the limb, or parts adjoining, are more or less remarkable, and seldom terminate in a salutary reaction, unless in a few cases, which admit of surgical interference by amputation, &c. When severe injuries are inflicted upon any part of the abdominal cavity, a state of stupor or apathy, yellowness of the surface of the body, collapsed features, and fatal sinking, as already described (§ 10.), either appear from the first, or supervene upon the symptoms just enumerated. In most of these severe injuries, and especially those produced by fire-arms, the amount of pain is very small compared with the intensity of the shock; and even where the shock is the greatest, the pain may be the least, or may even be entirely absent. Indeed, in many cases, the pain precedes the occurrence of reaction, and even favours the development of this salutary effort of nature.

12. Although surgeons have neglected to treat specifically of *shock*, — a state which particularly concerns them, as respects both the period and the prudence of operating, and the effects of operations, — the subject has been briefly adverted to by many, and especially by Larrey, Guthrie, Copland Hutchison, Dupuytren, and Hennen. It falls not within the scope of this work, to notice the remarks they have offered respecting it; but what they have advanced — which is extremely little — will be readily found in the works of these celebrated surgeons.

13. (*c.*) Injuries may be received directly or indirectly by the brain or spinal marrow, so as to produce a form of shock, which has been generally termed *concussion of the brain*, or of the *spinal chord*, as either may be affected. In such cases, with more or less shock to vitality, or to the frame, there is a special shock sustained by these nervous centres, the minute or ultimate organization and circulation of these parts being so changed or affected, as to instantly arrest all the functions they perform. With the phenomena of shock, as manifested in its more simple form (§ 10.), unconscious fæcal and urinary evacuations, sometimes with vomitings, are also present. When the injury thus implicates the brain, or upper portion of the spinal chord, the annihilation of the functions of

those parts especially distinguishes the case, although the marked and often rapid sinking of the heart's action, or the paralysis of the respiratory muscles, further characterises it, either of these being the more immediate cause of dissolution.

14. (*d.*) Cases often occur in which the shock is heightened by, or complicated with, either *internal*, or *concealed*, or *open hæmorrhage*. In these, the symptoms of simple shock (§ 10.) are more or less manifest, with great pallor of the surface, often with coldness and tremor, sometimes with succussions, or shudderings, or vomitings, passing into deliquium, or fatal sinking, especially when attempting to sit up. The action of the heart then ceases, and with it respiration; the cerebral functions either being but slightly disturbed, unless shortly before death, or ceasing in a way not to be distinguished from the accession of sleep, excepting in the rapid failure of the pulse and respiration. In the less severe cases of this kind, reaction may supervene, and recovery take place, when the nature of the injury causing the shock and hæmorrhage, and the consequences of both, admit of this issue.

15. (*e.*) The *fifth form* of shock depends more or less on mental causes of an intensely depressing nature. The physical effect may be entirely owing to the mental cause, or partly owing to this cause, or to alarm or dread of dissolution in connection with a physical cause, as in cases of gun-shot or other wounds, severe injuries, operations, &c. In these latter cases, the causes are both physical and mental; and the phenomena present a mixed character, more or less of mental alarm or of nervous phenomena, such as are above noticed (§ 11.) being associated with physical depression, — the symptoms of either the *first* or the *second* of these forms predominating with fright, anxiety, or most manifest alarm and distress, or of absolute terror, or even delirium, sometimes, in females, with hysterical convulsions, prolonged faintness or catalepsy. In this form of shock, the strength of mind, the nervous energy, or force of character of the sufferer, modifies remarkably the amount or intensity, as well as the particular form or state, of the physical effect; for the same intensity of cause, which might make but slight impression on a person thus mentally constituted, or on one physically robust, might produce a very dangerous effect on a delicate, nervous, and susceptible individual; this effect being, moreover, often attended by faintness, convulsions, incoherence, &c. Mental shock is more especially depressing and dangerous to persons who are the subject of organic diseases of the heart, or brain — of the former particularly — death often immediately following it.

16. II. The DIAGNOSIS and PROGNOSIS OF SHOCK require but little remark. — *A.* Of the *former*, it may be observed, that it is often difficult to determine whether or no a fatal result be owing to the immediate physical shock and mental alarm which an injury or operation produces, or to the consecutive effects on the frame, either by interrupting some important or vital function, or by contaminating the blood. True or simple shock is always instantly manifested on the cause producing it; it is generally attended by nearly all the symptoms already enumerated, by more or less mental alarm, and by a sensation of sinking and anxiety referred to the epigastrium and præcordia, sometimes with vomitings, characterised by slight, or even no effort, or with unconscious or involuntary evacuations, and an universal failure of all the vital functions. In some of the most severe cases of physical shock, instead of mental alarm, there is either delirium, or stupor, or apathy.

17. *B.* The *Prognosis* depends entirely upon the nature of the cause or injury, and the intensity of the effect indicated by the symptoms. Great slowness, or weakness of the pulse; or great frequency with feebleness, or irregularity; marked coldness, pallor or leaden hue of the surface; tremor, cold perspirations, vomitings, singultus; irregularity of the respiration; continual restlessness; a sensation of sinking or of impending dissolution; delirium, apathy, or stupor; involuntary evacuations; a jaundiced appearance of the surface; rapid failure of the pulse, &c., are all very dangerous, and often fatal symptoms. When the phenomena are less severe, and when the means employed are successful in bringing about a salutary reaction. or even in diminishing the severity of those now mentioned, then hopes of recovery may be entertained. But so much depends upon the nature and peculiarities of the case, upon the patient's feelings and opinions as to the issue, which should always be duly considered, and upon the progress and contingencies of the after-treatment, especially for complicated injuries, as hardly to admit of definite laws of prognosis being assigned.

18. Many of the injuries which occasion severe shock, involve the questions, 1st, as to the propriety of amputating a limb, or shattered or torn stump; and, 2nd, as to the period at which this operation should be performed. The first of these questions has been satisfactorily considered by surgical writers; but the second has been long a subject of discussion, many writers of experience taking different views of the matter. The differences of opinion, as well as of success, as regards the period, after these injuries, at which the operation should be performed, have arisen from the want of due attention to the existence or non-existence of the more marked phenomena of shock at the time of performing the operation, and from recourse having been too frequently had to it before these phenomena had subsided, or before the frame had recovered itself, either partially or more fully, from the shock it had experienced — before vital reaction had commenced, for, if a few hours be not allowed for this purpose, before the operation be attempted, the performance of it so rapidly upon the receipt of the injury may convert a state of shock, admitting of vital reaction, into a state of fatal sinking; or, if the vital energies continue to sink more and more, during the few hours thus allowed for them to rally, notwithstanding a recourse to rational means to this end, an operation will only add to the patient's suffering and accelerate the fatal issue.

19. III. TREATMENT OF SHOCK. — *The treatment of the more simple states* of physical shock (§ 10.) should be appropriate to the intensity or apparent danger of the symptoms. In the *slighter forms*, warm diluents, the application of external warmth, the allaying of mental alarm, a cheerful confidence evinced by the attendants, and a moderate recourse to gentle stimuli or restoratives, such as camphor, ammonia, æther, &c., in small doses, are generally all that may be re-

quired. But, in *severer* or *dangerous cases*, a more assiduous and a more liberal recourse to these means is absolutely necessary, and should be continued until indications of commencing reaction appear. In these, as well as in others of more imminent danger, even an assiduous and a decided use of these means may be insufficient to bring about the desired effect; and others must be brought to their aid. In these cases, more especially, the existence of mental alarm should be taken into account, and where it is inferred, — for it may exist without being made apparent, — the patient should be assured and encouraged. In all cases of a severe and dangerous nature, and where the occasion admits of having recourse to the means, the patient should be placed in a bed previously well warmed, and two young persons, according to the sex which may be proper, ought to be placed close to him, one on each side, without any intervening covering; and warmth should be promoted by sufficient bed-clothes. In some countries, it has been customary to apply animal heat in a different way, namely, by the skins of animals, torn from their bodies instantly on their being killed, and the internal surfaces applied directly to the patient's body, or even the opened bodies of the animals themselves, whilst still warm. I have seen these means employed, and certainly with greater success than I expected. In cases of shock from blows or contusions on the abdomen, or near the epigastrium, these means are appropriate, and their success admits of rational explanation.

20. In some cases, a stimulating or medicated warm-bath may be tried, salt, mustard, &c., having been added to the water. I do not, however, consider these as efficacious as animal warmth applied in either of the ways just mentioned; and I have generally preferred to warm baths, as being more efficacious, more immediate, and attended with less trouble and fatigue, or exertion, on the part of the patient, the application of flannels, wrung as dry as possible out of very warm water, then freely sprinkled with spirits of turpentine, and instantly applied over the epigastrium and whole abdomen, evaporation from them being prevented by dry cloths or oil-skin placed over them. These hot epithems should be continued or renewed until reaction commences, when they, as well as the internal means had recourse to, ought to be discontinued, and the case subsequently treated according to its peculiar requirements.

21. In those cases which present, from the nature of the injury, more or less of the nervous symptoms above noticed (§ 11.), various nervine remedies, in addition to those already mentioned, may be employed. In these more especially, and sometimes in others, opium, in certain states of combination particularly, is often of service. In conjunction with camphor, or with ether, or with ammonia and aromatics, it is a most valuable remedy. When delirium is present, camphor is required in full doses; whilst the addition of opium, or of morphia, soothes the irritability, and allays the restlessness sometimes present, and diminishes the mental alarm. But when delirium occurs, its passage into coma should be dreaded, and opium and other narcotics should be used with caution, and only in combination with camphor and other restoratives and anti-spasmodics.

22. When the hæmorrhage caused by injuries is so great as to increase the vital sinking attendant on shock, and especially when it increases the alarm of the patient, means appropriate to the circumstances of the case should be taken to arrest it. Prolonged faintness, coldness of the surface, and slowness or irregularity of the pulse, require a decided use of the means already mentioned (§ 19. *et seq.*), aided by the exhibition of ammonia, wine, warm, strong coffee, the horizontal position, and the external application of warmth, as already advised (§ 20.). If vomitings accompany this or other states of shock, the hot epithems prescribed above should be assiduously employed; and especially if convulsions or spasms of any part be complained of. Effervescing draughts, with the ammonia in excess, with opium, camphor, ether, &c., may also be given, or pills containing creasote, opium, and aromatics.

23. The terror and mental alarm often increasing the physical shock in most cases of severe injury, should be combated by the confidence and encouragement of the medical attendants, by a recourse to opium, ammonia, ether, mulled wine, &c. The states of mental shock produced by sudden and alarming moral causes, may occasion so severe physical effects, as to require similar means to those already advised. Faintness, more or less prolonged or repeated, or hysterical convulsions, or spasms, or delirium, may complicate the physical depression, and require the exhibition of diffusive stimulants, conjoined with anti-spasmodics and anodynes. In cases of general shock, from concussion of the brain or spine, the internal use of stimuli may not be required, and it should at all times be administered with caution. The turpentine epithem (§ 20.) may, however, be applied along the spine, when it is the special seat of shock, or even around the cranium, when the concussion implicates the brain, and an enema may be administered containing assafœtida, with a moderate quantity of camphor. But a recourse to these, or other means, should depend much upon the states of the pulse, and of the sensorium, at the time.

24. The external or local means must be left to the judgment of the medical attendant. Cold applications ought not to be made to the seat of injury, as long as coldness of the surface, collapse of the features, and failure of the pulse exist. They will not only aggravate these symptoms, but also increase the anxiety, sinking, and pain at the epigastrium, and the general restlessness and distress. Warm fomentations, with a decoction of poppy-heads, especially if much pain be experienced, or warm embrocations containing some preparation of opium, will generally afford some relief.

25. The injury, especially those produced by gun-shots, severe compound fractures, lacerations, &c., may require the removal of the limb. In this case, if the phenomena of shock produced by the injury be severe, this operation should not be performed until the constitution shows indications of rallying, either by the efforts of nature, — owing to the vital resistance in less severe cases, — or by the means above recommended. A few hours should be allowed for this purpose, — often not more than two or three, — seldom more than eight or ten hours; for if, at the termination of this longer time, reaction has not commenced, and

more especially if the vital depression has increased, the additional shock produced by the operation may rapidly terminate life. It will be better, therefore, to persevere somewhat longer in the use of the means advised for rallying the powers of life, and to increase the doses of these means, always with due reference to the previous habits of the patient, than to attempt an operation which will be of no avail.

26. As soon as indications of *vital restoration*, or of *vascular reaction* appear, the means resorted to for attaining this end should be relinquished; and gentle diaphoretics be given with the view of equalising the circulation and removing internal congestions, which are apt to occur during the vital depression caused by the shock. If the reaction be such as is attedned by heat and dryness of skin, full or strong pulse, thirst, &c., cooling diaphoretics, purgatives, and even blood-letting, especially if the previous loss of blood has been inconsiderable, should be prescribed; and these should be aided by such local means, in cases of severe injury, as their nature may require.

27. The reaction following mental shocks, especially in nervous, susceptible, and delicate persons, and females, is apt to be followed by *delirium* or *fever*, sometimes by *phrenitis* and inflammation of the brain or its membranes, on either of which *coma* is liable to supervene, and similar consequences may follow concussions of the brain or spinal marrow; in such circumstances, the treatment recommended for these diseases, under their respective heads, should be adopted. (*See arts.* Brain and its Membranes, Inflammations of; also Delirium, Coma, &c.)

28. In some instances, instead of either a salutary reaction or increased or inflammatory action of the nervous centres, or their membranes, the shock, whether mental or physical, degenerates into a low, incoherent, or muttering *delirium*, passing more or less rapidly into *coma* (§ 27.). In these circumstances, recovery rarely takes place; but, nevertheless, a strenuous recourse to the restorative means already mentioned, such as frequent doses of camphor, or ammonia, terebinthinate epithems on the scalp and epigastrium, stimulating enemata, &c., should not be neglected. (*See arts.* Delirium and Coma.)

Bibliog. and Refer.— I am not acquainted with any work or treatise on vital or nervous Shock, and but few writers notice it incidentally, far less describe it, or advise a treatment suitable to its several states. I have treated of Shock in this work, because I consider it a most important and dangerous affection implicating more or less the whole vital and animal functions, and hence, coming strictly within the province of the physician, as well as within that of the surgeon. When we consider that, of the numerous accidents and wounds which cause death, the greater proportion produce this effect by the severity and suddenness of the shock to the vitality of the frame, rather than by any interruption to the functions of the injured part, the interest of this subject will appear in its true light. The principal works in which it is incidentally mentioned are the following: — *Larrey*, Mém. de Chirurg. Militaire. 4 tomes, 8vo. Paris, 1812—17. — *G. Guthrie*, On Gun-shot Wounds of the Extremities, 3d ed. 8vo. Lond. 1827; and on Wounds and Injuries of the Abdomen and Pelvis, 8vo. Lond. 1847. — *J. Hennen*, Principles of Military Surgery, 2d ed. Edin. 8vo. 1820. — *A. Copland Hutchison*, Practical Observations in Surgery, 8vo. 2d ed. 1826; and Observations on the Period for Amputating in Gun-shot Wounds, 8vo. Lond. 1817. — *Dupuytren*, Leçons Orales de Chirug. Clin. t. ii. art. 7. t. iv. art. 7. et 14. — *S. Cooper*, Surgical Dictionary, 7th ed. 8vo. Lond. 1838, p. 660.

SKIN:—Synon.—*Integuments*; *Integumental Sac, or envelope of the frame*; *Cutis*, *Corium*, *Derma*; —*die Haut*, *das Fell*, Germ.; — *Peau*, Fr.

Classif. — General and Special Pathology — Symptomatology.

1. I. Functional Alterations. — The *skin*, or integumental sac or covering of the body, discharges more important functions than have commonly been imputed to it. I long ago, and more recently in various parts of this work, endeavoured to prove, that the skin performs offices of a very high order in the œconomy; that through it, effete and excrementitious matters are carried out of the blood, and that in this respect, as a depurating organ, it aids the functions of the kidneys, of the large bowels, and of the lungs; an impairment of the functions of either of these being often attended by a vicarious increase of its actions. It is thus an eliminating organ, contributing to the depuration of the blood, generally to an extent more or less intimately related to the amount of function performed by the other emunctories. That the skin performs a vital action, consisting of an insensible and a sensible exhalation the amount of either depending much upon the state of the atmosphere, is generally admitted. Increased transpiration may proceed from a variety of causes; and so may diminished transpiration, and either, in its more manifest states, is an important indication of disorder. The insensible perspiration may become sensible, owing only to a mild, warm, or humid state of the air; whilst the perspiration may not only be insensible, but this state of it may be much increased by more or less evaporation of the fluid in the skin by great dryness of the air.

2. *A.* When the halitus, or transpiration of the skin exceeds the evaporation of it in the atmosphere, sweat is formed; but, in addition to the substances contained in the perspiration, carbonic acid is also given out by it. In healthy persons, the skin exhales carbonic acid, nitrogen, and a watery fluid containing small quantities of the following substances: — 1st. Matters soluble in ether: traces of fat, sometimes including butryic acid.—2d. Substances soluble in alcohol: alcoholic extract, free lactic and acetic acids, chloride of sodium, lactates and acetates of potash and soda, lactate or hydrochlorate of ammonia.—3d. Substances soluble in water: watery extract, phosphate of lime, and an alkaline sulphate.—4th. Substances insoluble in water: desquamated epithelium, and phosphate of lime with a little peroxyde of iron.

3. Carbonic acid and nitrogen gases are exhaled in constant, but in varying proportions. Collard de Martigny states, that they are exhaled in the greatest quantities after meals and violent exertion; and that vegetable food causes an excess of carbonic acid, and an animal diet an excess of nitrogen. It may be regarded, with Edwards, that the physical exhalation of the skin is pure water and these gases; and that the organic function of the skin is the elimination of the above substances. (§ 2.) The proportion and amount of these matters vary much in different races of men. From several experiments, made many years ago on the Negro, I found that the gaseous exhalation from the skin, as well as the solid matters contained in the perspiration, especially the former, was much greater in this, than in the white race; and that the function of the skin in the former was

more decidedly supplementary of that of respiration than in the latter. Indeed, the cutaneous function of the negro race is of a much more decidedly eliminating nature, than that of the white race.

4. Besides the perspiration, the skin furnishes, by means of its sebaceous glands or follicles, a substance consisting of stearin, albumen, extractive matter with olein, phosphate of lime, &c.

5. The eliminating function of the skin is suppressed or interrupted in many diseases, especially in inflammations, until suppuration commences, in the early stage of fevers, in scurvy, in diabetes, &c.; whilst it is more or less augmented in the sweating stage of agues, in some adynamic forms of fever, in pestilential cholera, in acute rheumatism, in the advanced stages of tubercular consumption, in internal abscesses, and in other colliquative maladies.

6. *B.* The perspiration may be variously changed in *quality* in several diseases, owing to the contamination of the blood by some specific animal poison, or by the combinations of elements or materials which are usually, in health, eliminated from the blood by the several emunctories, and which, when either of these emunctories become impaired in function, accumulate in the blood, and are evacuated, in different combinations or states, in the cutaneous exhalations. Thus the sweat of rheumatic and gouty persons is generally acid, whilst in putro-adynamic fever, and in scurvy, it has a putrid odour. The perspiration of persons affected with itch, is said to emit a mouldy odour, and that of syphilitic patients has a sweet smell. STARK states, that the sweat of scrofulous persons resembles the odour of sour beer. The perspiration of persons labouring under small-pox or measles, or pestilential cholera, or scarlet fever, is often so peculiar in each of these maladies, as to lead to the recognition of the disease by its scent alone. On entering a house in which cholera was present, I have recognised the malady by the odour of the effluvium from the patient before I have seen him. The sweat is not only abundant, but often presents an urinous odour, in suppressions of urine, or other obstructions of the urinary organs.

7. *The lactic acid*, which is the usual free acid of the perspiration, is generally much increased in acute rheumatism and gout, especially the former. Dr. PROUT found free *acetic acid* in the sweat of a person in hectic fever. STARK says, that lactic acid is increased in the perspiration during scrofula, rickets, and various cutaneous eruptions; and both it and acetic acid exist in the sweat of females during their confinements, and even during suckling. The putrid sweat in adynamic fevers probably contains *ammonia*. The *saline ingredients* of the perspiration may be much increased. Dr. PROUT observed the skin of a man in dropsy covered with a white crust of chloride of sodium after an abundant sweat. In cases of gout, of urinary concretions and urinary obstructions, the quantity of phosphate of lime, and of other salts, is more or less augmented.

8. *C.* The foregoing consists only of an increase of the *normal constituents* of the perspiration; but *abnormal constituents* may be present. ANSELMINO and STARK assert, that *albumen* may exist in the sweat in rheumatic fever, in putrid, gastric, and hectic diseases. *Blood* has been seen in the perspiration in scurvy, and in putrid and yellow fevers. *Uric acid* and *urate of soda* have been found in the sweat of persons suffering from gout and urinary calculi. *Bilin* and *biliphæin* have been found in the perspiration of jaundiced persons, and sometimes in those labouring under low, bilious, remittent fevers. This secretion has, in rare instances, been seen variously coloured, owing to the existence of certain colouring matters, as cyanurin, &c. *Fat* has been found in the sweat in some colliquative maladies.

9. Various *substances, foreign to the œconomy*, may have been taken into the body and appear in the perspiration, especially sulphur, mercury, iodine and its combinations, indigo, saffron, assafœtida, camphor, &c. But as regards these and various other substances which are carried into the circulation, and eliminated from it by the emunctories, it is difficult to determine, unless by well-planned experiments, how much of this elimination is performed by the skin, or by the pulmonary exhalation, or by the kidneys.

10. II. ALTERATIONS OF APPEARANCE AND STRUCTURE.—i. The *temperature* of the skin varies much in disease, and somewhat in different constitutions and temperaments. It is generally *below* the healthy standard in scurvy, in some states of chronic rheumatism, in paralysis especially in anæsthetic paralysis, and in pestilential cholera most remarkably. The temperature is very much *increased* in the early stages of most fevers, especially in those characterised by augmented vascular action, and when transpiration from the skin is much diminished, or altogether suppressed. In these cases, more especially in ardent fever and inflammations, and in some states of malignant fever, the skin is not only hot, but it also conveys the sensation of an acrid or burning heat, even above that which the actual rise of temperature should impart. In all inflammations and acute diseases, the heat of skin is increased, especially when the perspiratory functions are interrupted. The temperature of the skin is also greater than natural, when the blood is loaded with excrementitial elements, owing to diminished elimination by the kidneys, bowels, and skin, and more especially when the accumulation of these elements in the blood is attended by febrile or increased vascular action. It is also sometimes increased shortly before dissolution, probably owing to this state of the blood.

11. ii. *The colour of the skin* is variously changed in disease, and this change may be general, or in large patches, streaks, or in small spots or points. The change may consist either in absence of colour, or uncommon pallor, or in a deepening of the tint. All changes of colour arise from the quantity and quality of the blood circulating in the vessels of the cutis vera; or, in the opinion of ROKITANSKY, from the state of the epidermis, especially its inner, or Malpighian layer, from some change in its cells, or from some unusual pigment in them.

12. *A. Pallor* of the skin is owing either to excessive loss of blood, to exhausting maladies, or to the chronic deficiency of red globules, observed in spontaneous anæmia, and some states of dropsy. The pallor may be associated with a slightly greenish or etiolated hue, as in chlorosis. It arises, in rare instances, from a congenital deficiency of pigment in the dark races, as observed in Albinoes, or from an acquired defect of this

kind. This latter change — achroma — may occur in all races, is generally limited in extent, or consists of a number of spots, of various sizes, that gradually spread.

13. *B. Yellowishness* of the skin is one of the most common alterations of colour. The shade may be very pale or very deep, or the yellow may be mixed with green; and even a dark greenish hue may predominate. These shades of colour occur in the different states of jaundice, and are most frequently owing to biliary obstructions occasioned by disease of the liver, or gall-bladder, or of the gall-ducts. Various tints, varying from yellow to yellowish green, to a yellowish blue, seldom uniform in all places, or continuing of the same depth or shade, are observed in the courses of pestilential yellow fever, or hæmagastric fever, when the blood becomes much altered, and resemble the discolourations caused by contusions. This change occurs in large blotches, patches, streaks, &c., and is not limited to any one part of the body.

14. *C.* A *dark, sallow*, or *muddied aspect* of the skin is observed at an early stage of typhoid or adynamic fevers, and this appearance often increases as the disease advances. It is owing chiefly to the state of the blood produced by defective oxyganization, or by imperfect depuration by the emunctories. A hue resembling this, but deeper, or inclining to brown, or to brownish yellow, seems to be owing to the deposit in the epidermis of a pigment. It occurs most frequently in spots or in patches or streaks, very rarely over the whole surface. I have observed it in spots and patches in a lady, who many years previously was the subject of jaundice. The uniform embrowning of the skin, by exposure to the sun, the spotted stains or freckles — ephelis, and the liver-spots, connected with disorders of the biliary apparatus, or of the uterine functions, are modifications in the colouring matters retained by the epidermis. Rokitansky remarks, that the skin sometimes becomes dark, when, with neglect of it and indulgence in alcohol, are combined infiltration of the liver with fat, and a tallowy state of the sub-cutaneous layer of fat. The skin in this case feels fatty, soft, and velvety, like that of a negro; its colour proceeds from the deposition of a pigment, containing fat, in the deepest layer of the epidermis, — a fact of much interest, owing to the association it evinces.

15. *D. Redness* of the skin occurs in so diversified forms, and with so numerous shades of yellow, blue, brown, livid, copper or bronze colour, &c., as to elude precise description, unless in affections and alterations of which these colours are pathognomonic. Of the several congestions, inflammations, impetiginous, exanthematous, chronic and specific eruptions, these colours are severally characteristic. The redness passes into blue, or bluish yellow, even to black, after exudations of blood into the cutaneous tissue; as in the sugillations, ecchymosis, vibices, petechiæ, &c. of scurvy, purpura, maculated and malignant fevers.

16. *E. Blueness* of the skin is the characteristic of cyanosis, which is more or less general, although somewhat deeper in parts which are delicate and vascular, and in the extremities. When it is limited to particular parts, it is usually the result of congestion, or of cold. A transient blueness of various parts of the surface has been remarked in rare instances by Otto: but in small patches or spots this discolouration is not infrequent. A *deep leaden*, or bluish tint, attends the collapse of pestilential cholera, but it is deeper on some parts than in others, especially shortly before dissolution. It also appears, in a slighter degree, in the face and extremities, in threatened asphyxia from congestive pneumonia, general bronchitis, hydrothorax, and from congestion of the lungs. A blue tint, approaching to bronze, is sometimes produced in the skin by the protracted use of nitrate of silver, and remains permanent, or nearly so, during life.

17. *F.* A *blackish tint* is sometimes observed in aged cachectic persons, especially in the lower limbs, and extends over large portions of the skin. It has been called melasma, and is different from melanosis. Lighter shades of black, passing into a tawny, dirty grey, leaden hue, &c., are sometimes observed in connection with various acute and chronic diseases, characterised by extreme cachexia and dyscrasis of the blood and soft solids, especially pestilential and malignant maladies, scurvy, cancer, &c.

18. iii. *The texture of the skin* is often remarkably affected; and changes of texture are also attended and followed by alteration of colour.—*A. Anæmia* of the integuments is observed chiefly in universal anæmia, but it may affect the integuments of the extremities only. The skin is always pallid when anæmied; and the pallor presents a waxen hue when the skin is delicate, and the parts beneath are fat or œdematous.

19. *B. Congestion* of the skin is observed after death in the most depending parts. It is seen in some adynamic or malignant diseases, occasioning lividity, dark-redness, or a bluish or blackish tint, and is most manifest in parts most remote from the heart, and when mechanical obstructions of the circulation exist.

20. *C. The exudations of blood*, or small, circumscribed hæmorrhages, into the tissues of the skin, forming small spots or larger patches, or sometimes streaks, observed in purpura, in scurvy, and in petechial fevers, have been ascribed by Rokitansky to a higher degree of congestion of the skin; but however greatly these changes may be owing to the cause to which he imputes it solely, they depend more on impaired irritability of the extreme capillaries, on diminished vital cohesion of the tissues composing the skin, and on dyscrasis and other changes in the blood itself. (*See art.* Hæmorrhage, §§ 14—19.)

21. *D. Inflammations* very frequently attack one or more of the tissues composing the skin. They are sometimes idiopathic and substantive diseases, especially when produced by external or physical causes; but they are more frequently symptomatic, or caused by morbid conditions of the circulating fluids, arising from a superabundance of excrementitial elements and materials in the blood, or from a specific animal miasm or poison. Most of the chronic eruptions, or inflammations, depend upon morbid states of the blood, caused by impaired depuration by the kidneys, liver large bowels, or by the skin itself. Some of these inflammations may also appear as a morbid reflection on the skin of disordered actions of important internal viscera. Inflammations of the skin are either limited to spots or to patches, more or less numerous, or diffused over large tracts. They sometimes are seated only, or chiefly, in the

external layer and papillæ, as in *erythema*; and at others, the deeper layer, and the whole thickness of the corium, are affected, as in *phlegmonous* inflammation. From these forms, there are numerous transitions and associated changes, according as one or more of the layers or tissues composing the integuments, or as the subjacent cellular tissues, are implicated, and as the disease may extend in spots or patches, or become more or less diffused. Inflammations of the skin, whether erythematous, exanthematous, impetiginous, phlegmonous, furuncular, gangrenous or ulcerative, or acute, chronic or specific, have been so fully described in the numerous articles or heads to which they severally belong, that I cannot devote further space to their special consideration, more particularly as there is nothing of importance which I can add to what has already been advanced respecting them individually.

22. E. *Adventitious growths* in the skin have been described chiefly in respect of their internal characters, and often commence in the subjacent cellular tissue. — *a. Molluscum simplex*, or soft, wartlike growths, attached by a pedicle, consists of saccular dilatations of the corium, and contains cellular tissue, and sometimes also fat. — *b. Fleshy excrescences*, which often form on the nose, are composed of a luxuriant growth, or hypertrophy, of the corium, and of cellular tissue.

23. — *c. Condylomata* commonly form about the organs of generation and the arms, especially in the mucous membrane of the former. They are either soft, or more or less firm; and in their form they are either broad, or rounded, or pointed. They are often attached by a pedicle, their extremities resembling a mulberry, a cauliflower, or a cock's comb. They are composed of an investing layer of epithelium, and of newly-formed cellular tissue. They originate in the corium, where they take deep root. With these, ROKITANSKY believes, that certain tumours regarded as syphiloid, the Radesyge, &c., may be connected.

24. *d. Fatty tumours* are most frequently congenital, but they are sometimes developed at later periods of life. One only may exist, or there may be several on different parts of the body. They are rounded, often truncated, and attached by a pedicle, and they sometimes reach a very considerable size. They consist of a prolongation of skin, as if protruded by an inclosed lobule of fat, which is continuous, by a sort of pedicle, with the subcutaneous, adipose stratum. The epidermis covering them is sometimes dark-coloured, owing to the pigment it contains, and hair occasionally grows upon them. When congenital, it is often associated with nævus in other parts of the skin.

25. *e. Fibrous tissue* occurs in the skin after repeated or chronic attacks of inflammation, and in the cicatrices after burns and other injuries. The alteration termed *cheloid* by ALIBERT, is connected with the fibrous; for it appears to consist of a fibrous callus, and with that appearance its external cicatrix-like aspect corresponds. ROKITANSKY describes this latter alteration, — the cheloid — as consisting of several varieties, — of a simple hardness or callosity of the skin; or of a flat, somewhat raised, or a depressed hardness; or of a cord-like hardness, and of a white, or pale, or rose-colour. In either form, it may terminate in white or red elevated lines or processes. It is of inconsiderable extent, and occurs, for the most part singly, at the upper part of the trunk, on the extremities, or on the face. It rarely exists in large numbers, and it seldom ulcerates; when it does so, it becomes indolent and difficult to heal. It is generally connected with constitutional disorder, but it is not truly cancerous.

26. *f. Bony deposits* are extremely rare in the skin. ROKITANSKY once found a bony plate, which was oval, yellowish, hard, and rugged, of the size of a half-crown, in the substance of a scar on the trunk. It corresponded precisely with the osseous deposits occurring in fibrous exudations on serous membranes.

27. *g. Vascular nævi—teleangiectasis*—are generally congenital. They sometimes form deep or bluish red stains, of various sizes and shapes; occasionally red tumours, resembling cherries, strawberries, or mulberries, and often present a transient swelling, — *erectile* or *splenoid tumours* of some authors. They also commence, in rare instances, after birth, or at later periods, and are at first, or even subsequently, not malignant; but they may, in the cancerous diathesis, be converted into malignant growths — into a fungus hæmatodes cutis.

28. *h. Melasma*, or the blackish discolourations observed chiefly in aged, decrepit, and cachectic persons, occurs either diffused in parts of the surface of the body, especially the lower extremities, rarely over the whole surface, or concentrated in small raised spots, or berry-like tumours, on the trunk or face. In the former, the colouring matter is diffused on the surface of the cutis; in the latter, in the substance of the cutis also. Melasma should not be confounded with melanosis, the cancer melanodes.

29. *i. Tubercle.*—It is doubtful whether or no true tuberculosis affects the skin in a way corresponding to that observed in mucous, serous, and parenchymatous structures. Tubercles, however, appear in ulcers affecting the cutaneous expansions of scrofulous persons, but most frequently in a softened form, or in that of puriform tubercular matter. An ulcerative softening of the skin, in connection with tubercular deposits in the subcutaneous cellular tissue, or in lymphatic glands, is a common occurrence.

30. *k. Cysts* do not occur in the cutis vera; but the sebaceous glands often degenerate into cysts of considerable size. Cysts also form in the subjacent cellular tissue, and become closely connected with the skin. These, as well as morbidly-enlarged sebaceous follicles, commonly contain cholesterine. This substance has also been met with as a stratum on the surface of open ulcers of the skin.

31. *l. Cancer* and cancerous ulceration are often met with on the skin. When cancer commences in the subcutaneous or glandular tissues, particularly the mammæ and lymphatic glands, it generally soon implicates the skin, and becomes, from an early period, very closely connected with the cutis. But cancer often also originates in the skin, in the form either of fibrous or scirrhous cancer, or of medullary cancer.

32. (*a.*) *Fibrous cancer* of the skin generally assumes the form of a tuberculated or rounded nodule, sometimes flattened, or even depressed, below the surface of the skin, and forming an umbilicated fossa. It is generally single, about

the size of a hempseed, pea, or small nut, firmly fixed, and as hard as cartilage. Sometimes it is smooth and shining externally, occasionally covered by a hard, laminated crust of cuticle, and often darker than the surface around. It occurs chiefly on the face, lips, and nose, but occasionally on other parts of the body. It is commonly the primary cancerous growth, and often the first of a series of cancerous formations in different organs. In some instances it reaches a considerable size, growing into a tuberous mass, projecting beyond the skin. (ROKITANSKY.)

33. (*b.*) The *medullary kind* is usually a secondary formation, and consequent upon large cancerous growths, which first appear just beneath the skin, or which involve the subcutaneous structure first, and then the skin itself. In either case it grows in the skin in isolated or confluent nodules near the primary mass. It sometimes also appears in the skin, after it has been localised in one or more organs. The nodules which it forms in the cutis are mostly numerous, and about the size of peas or hazel-nuts; they are scattered over the body, especially over the trunk, and generally near similar growths in the subcutaneous cellular tissue. In the case of a boy, about 14 years of age, for whom I was consulted, I counted upwards of twenty thus disseminated. It is characterised as a whitish, or whitish red growth, which is sometimes tolerably firm and lardaceous, or medullary, and occasionally looser, softer, and resembling cerebral substance, or even much softer and diffluent; and it often grows to a considerable size. It may also contain black pigment, and thus constitute *cancer melanodes* of the skin. The layer of skin above the nodule becomes stretched, and shining or transparent, or rough from the loss of its epidermis. Sometimes the elementary particles of the disease are deposited in vascular *nævi*, or, as the deposition takes place, the vessels of the part are excessively developed, and a cancerous structure, of uncommon vascularity, is the result, or *fungus hæmatodes* of the skin. ROKITANSKY considers *chimney-sweepers' cancer*, and ALIBERT's *eburnated cancer of the skin*, as special varieties of this disease.

34. *a. Chimney-sweepers' cancer* appears to be medullary. It begins in the scrotum as a tolerably firm, small nodule, or warty excrescence, which after some time becomes red, excoriated, moist, and covered by a cortex of thickened cuticle. The papillæ beneath enlarge, and the whole becomes an ulcer, with irregular, hard, and raised edges. Fresh nodules form around the original one, undergo the same changes, and enlarge the disease superficially. The nodules are developed into fungous cauliflower excrescences, and the disease extends deeply, until the dartos, the tunica vaginalis, and testicle are successively implicated, and the gland itself ulcerates, while the adjoining lymphatic glands and vas deferens degenerate up to the abdominal cavity.

35. *β. Eburnated cutaneous cancer* is a secondary degeneration of the cutis over a subcutaneous scirrhous mass. The skin is white, glistening, indurated, partially transparent, and immoveable, over the firm or hard mass. This change of the skin evidently belongs to the fibrous form of cancer, as it is always connected with the subjacent scirrhus. *Cancerous ulceration* supervenes, at a sooner or later period, upon all the forms of cutaneous cancer, and generally proceeds as I have described when treating of CANCER. (*See that art.* § 11. *et seq.*)

36. *m. Parasites.*—Several kinds of *pediculi* are found on the skin, especially on parts covered by hair; and the *acarus scabiei*, and probably other species of the genus acarus, occur on, and in eruptions of, the skin. Various fungi also exist in certain chronic eruptions on the cutis, as in cases of *tinea favosa*, and *sycosis*. The subcutaneous cellular tissue not infrequently lodges the *filiaria medinensis*, especially in certain climates, as the western coast of Africa, &c.

37. III. THE SEBACEOUS GLANDS, or follicles, and their ducts, are often the seats of various disorders; and in many of the affections of the skin, and in some of the exanthemata, especially small-pox and measles, they are especially implicated. But they are more manifestly the seat of disorder, when an accumulation of thin secretion takes place in them, owing to an impaired power of discharging it, or of throwing it off, or to obstruction of their ducts. In the former state, or impaired power of excretion, the duct is enlarged, and filled with the accumulated secretion, forming what has been termed *maggots*. In the latter state, the secretion accumulates in the follicular sac itself, and produces a rounded tumour, from the size of a millet-seed to that of a hazel-nut, or even larger. The matter thus accumulated consists of a whitish substance, of a pulpy consistence, viscid like fat, and resembling adipocire. In many cases it is very offensive in its odour, and irritating to the containing tissues, thereby producing inflammation, as in acne, sycosis, &c. Calcareous deposits, and even horny excrescences, may even originate in those glands in very rare instances. The secretions of the sebaceous follicles may be either deficient in quantity, altered in quality, or excessive in amount; and, in either case, occasion a more or less manifest disorder of the functions of the skin. In the *first* of these conditions, the skin will be dry and harsh; in the *second*, the exhalation from it will be more or less offensive; and in the *third*, it will be unctuous, humid, and often also offensive to the smell.

38. IV. THE CUTICLE AND NAILS partake in several of the diseases of the skin.—(*a.*) The *cuticle* is sometimes very thin and delicate throughout, owing to original formation, but more frequently only in parts, especially in those where it has been recently thrown off. It is much more frequently formed in excess; and then either its outer layers are separated in the form of bran, scales, scurf, or laminæ, or it accumulates and adheres, producing callosities, corns, or crusts, of various forms and sizes, occasioning more or less uneasiness, or pains of the subjacent parts.

39. *a.* The *colour* of the skin partly resides in the deeper layers of the cuticle, which may contain a yellowish, brownish, or a black pigment, distinguishing, when congenital and general, particular races or individuals. But the colouring may be acquired, and limited to particular spots or parts, or be more or less diffused, and indicate disorders of important internal organs, or a cachectic condition of the whole œconomy. It is always in excess, in a remarkable degree, in congenital nævi. A complete absence of the colouring matter is congenital in albinoismus, and is acquired in achroma or vitiligo. The former may be general

or partial; the latter is always partial at first, but it may become more general.

40. (a.) The epidermis is often drier and harsher than natural, it is rarely more moist. It presents the former states in various cutaneous diseases, in which it is either thrown off in the form of scales, or it accumulates, and occasions cracks or fissures, extending through it into the cutis. Accumulation of the epidermis, or of the cells composing this structure, is often simultaneous with, if not the consequence of, excessive development of the papillæ of the cutis. The morbid results of these conditions are one or other of the following: — 1st. *Callosity*, tyloma, or simple accumulation of epidermoid cells, in the form of strata, successively formed underneath, the more recently produced extruding the older; — 2d. *Corn*, or clavus, a circumscribed callus, projecting into the corium, and occasioning more or less pain; — 3d. *Crusts*, scales, or scutiform accumulations of laminæ of diseased epidermis, presented by the scaly eruptions; — 4th. *Horny growths* proceed either from a diseased portion of skin, or from a sebaceous follicle; and are met with generally on the scalp, and are usually single, much more rarely two or more are observed. They are of various dimensions, from half an inch to several inches in length, and as thick as, or thicker than, a finger; straight, or curved, or crooked; attached by a broad base, and of a dark colour. They have been observed in some cases to be regularly shed at intervals; and when removed, they are reproduced, if the portion of skin producing them be not destroyed.

41. (*b.*) The *nails* often present the peculiarities possessed by the parents, or evince hereditary characters. Their growth may be excessive or deficient; or they may be misshapen or thick, twisted, or curved. They may be everted or inverted; or become excessive in length, or much shortened. Eversion is often observed in psoriasis, when shortening, thickening, and induration are often co-existent with it. The nails are then discoloured, and are also drier and more brittle than natural. Incurvation of the nails, sometimes with elongation, is common in tubercular consumption. The most deformed states of the nails are observed in connection with the scaly eruptions. (See the articles on these eruptions, and that on the *Hair*.)

42. V. CLASSIFICATION OF THE DISEASES OF, OR AFFECTING THE SKIN. — The arrangement of diseases of the skin must necessarily be conventional. All disorders of the animal œconomy, — whether functional or structural, whether local or constitutional, whether internal or external, — glide insensibly into those more intimately allied to them in situation, in the nature of the tissues affected, in constitutional disturbance, and in the local and general characters of the affection; and present no constant lines of demarcation by which they can be accurately separated from those which they most resemble. Morbid actions, even in their most visible and palpable forms, evince none of the unalterable features characterising the products of the vegetable and animal kingdoms. These products belong to distinct genera and species, and each consists of a specific being; but morbid actions are incalculably diversified, and ever varying, passing insensibly, and more or less rapidly, into as varying states of visible disease, and ultimately into not merely manifest but also palpable organic changes, when the earlier phases or grades of morbid action are not arrested by vital resistance, or by the aid of medicine.

43. Of the more or less *artificial classifications* of diseases of the skin, furnished by PLENCK, WILLAN, BATEMAN, PLUMBE, RAYER, WILSON, and others; or of the *natural arrangements* attempted by ALIBERT and PAGET, most of the former being modifications of the classification of PLENCK or WILLAN, it is unnecessary to take particular notice. An artificial arrangement involves frequent repetitions when treating of this class of diseases, — presents as unvarying distinctions what are continually undergoing changes, and are neither peculiar nor constant, — and insufficiently recognises constitutional disturbances, specific taints, and contaminating causes. Natural classifications, whilst they are based on natural alliances arising out of constitutional conditions, and specific causes or contaminating influences, retain those visible or palpable distinctions which actually exist, and present them for the purposes of diagnosis and of rational treatment. The artificial plan comprises, under the same order, eruptions which require the most opposite indications and means of cure; whilst the natural arrangement associates those maladies in one family or order, for which the same indications and remedies are found most beneficial. Without entirely neglecting the classifications of ALIBERT and PAGET, the following has been devised with a much stricter adhesion to constitutional and natural alliances than these writers have shown, and with a due recognition of the causes, contaminating characters, and ultimate changes, which distinguish these diseases individually, and which connect each group and family with those preceding or following it. The reader will perceive, by comparing the following arrangement with those of the authors above mentioned, in what it differs, as well as in what it agrees with them.

44. ORDER, FAMILY, OR NATURAL GROUP I. DYSCHROMATA — *Maculæ.* — Changes of colour, or excess or deficiency of the colouring matter of the skin, occurring congenitally, or at any period of life, generally in spots or large patches, and frequently connected with slight disorder of the digestive organs, or of the general health.

45. GENUS i. — PANNUS — EPHELIS, — *Chloasma.* — Consisting of spots, patches, &c., of various forms, of a darker or deeper hue of the skin, owing to increase of its colouring matter, occurring at any period of life. — *Spec.*: 1st. *P. lenticularis*; — 2d. *P. hepaticus*; — 3d. *P. melaneus*; 4th. *P. carateus*. (*See art.* EPHELIS.)

46. GENUS ii. — ACHROMA. — White spots or patches scattered over the skin, or limited to a part, the decolouration being remarkable, and often attended by temporarily impaired sensibility, owing to deficient or interrupted arterial circulation, when the extremities are its seat. — *Spec.*: — 1st. *A. Vitiligo*; — 2d. *A. Congeniale*.

47. ORDER II. DERMATITES — D. SIMPLICES — ECZEMATA — *Eczematosæ.* — Inflammations of the skin, attended by redness, itching, stinging, slight swelling, or an eruption of papulæ, vesicles, bullæ, pustules, or tubercles; often being of local origin, but much more frequently depending upon disorder of the digestive and eliminating organs, and consecutively of the circulating fluids; and observing either an acute, or sub-acute, o-

chronic course. They are not limited to any part of the cutaneous expansions; they may affect one or more of the cutaneous tissues, or even extend, more or less, to the subjacent cellular substance; and they are not contagious.

48. Genus i. — Erythema. — Superficial redness, varying in extent, with slight elevation, terminating in furfuration and desquamation, or, in cachectic habits, from neglect of cleanliness, or improper treatment, in excoriation or ulceration. —*Spec.*: 1st. *E. spontaneum*; — 2d. *E. endemicum*; — 3d. *E. epidemicum*; — 4th. *E. Intertrigo*; — 5th. *E. Paratrimma*; — 6th. *E. Pernio*; — 7th. *E. per Adustionem*. (*See art.* Erythema.)

49. Genus ii.—Roseola—*Rose-Rash*.—Rose-coloured, irregular, and slightly elevated patches of the skin, transient and not papular; passing into deeper roseate hues as they disappear, generally preceded or attended by slight fever, or gastro-intestinal disorder.—*Spec.*: 1st. *R. æstiva*; — 2d. *R. autumnalis*; — 3d. *R. annulata*; — 4th. *R. infantilis*; — 5th. *R. symptomatica vel associata* — of small-pox, of cow-pox, of fever; of gout, of the consecutive fever of pestilential cholera. (*See art.* Rose-Rash.)

50. Genus iii. — Urticaria. — An eruption of irregular, prominent patches or wheals, of various sizes, generally transient, and attended by burning, tingling, and itching, and by slight fever and disorder of the digestive functions. — *Spec.*: 1st. *U. febrilis*; — 2d. *U. evanida*; — 3d. *U. tuberosa*.

51. Genus iv. Lichen — *Licheniasis*. — An eruption of clustered or irregularly-disseminated papulæ, attended by itching, stinging, &c., and slight febrile disturbance, or gastro-intestinal disorder, terminating in desquamation, and liable to recur. — *Spec.*: 1st. *L. simplex*; — 2d. *L. Strophulus*; — 3d. *L. agrius, vel L. tropicus*. (*See art.* Lichen.)

52. Genus v. — Prurigo. — A papular eruption, the papulæ being larger than those of lichen, of nearly the colour of the skin, generally appearing on the outer surface of the limb, attended by burning and intolerable itching, &c. — *Spec.*: 1st. *P. mitis*; — 2d. *P. formicans*; — 3d. *P. senilis*. (*See art.* Prurigo.)

53. Genus vi. — Eczema. — An eruption of minute vesicles, crowded together, non-contagious, and terminating by the absorption or evaporation of a thin fluid, or by excoriations, with serous exudations, concreting into crusts. — *Spec.*: 1st. *E. simplex*; —2d. *E. rubrum*; —3d. *E. impetiginodes*; — 4th. *E. mercuriale*. (*See* Eczema.)

54. Genus vii. — Herpes. — An eruption of vesicles, distinctly but irregularly clustered, upon inflamed bases, extending beyond the margins of the clusters, attended by tingling, concreting into lamellar scabs. — *Spec.*: 1st. *H. phlyctenodes*; — 2d. *H. circinnatus*; — 3d. *H. Zoster*; — 4th. *H. præputialis*; — 5th. *H. Iris*. (*See art.* Herpetic Eruptions.)

55. Genus viii. — Bullæ. — An elevation of the epidermis by an effusion of serum, often passing into a sero-puriform fluid, into large vesicles or blebs, which are generally round or oval, have a broad base, and vary in size from that of a pea to that of an egg. — *Spec.*: 1st. *Pemphigus*; — 2d. *Rupia*. (*See arts.* Bullæ, Pemphigus, and Rupia.)

56. Genus ix. — Ecthyma. — An eruption of phlyzaceous pustules, always distinct, seated on a hard, inflamed base, and followed by dark scabs, leaving slight cicatrices or red stains, which disappear after some time. — *Spec.*: 1st. *E. acutum, vel E. vulgare*; — 2d. *E. chronicum, vel E. cachecticum*. (*See art.* Ecthyma.)

57. Genus x. — Impetigo — *Mellitagra*.— The eruption of psydraceous pustules, commonly grouped in clusters, sometimes distinct, and forming yellowish, rough incrustations; attended by itching, but by little or no fever. — *Spec.*: 1st. *I. simplex*; — 2d. *I. favosa, vel Porrigo favosa*: — 3d. *I. eczematosa*; 4th. *I. rodens*. (*See art.* Impetiginous Affections)

58. Genus xi. — Acne — *Varus* — *Adenodermatitis*. — A pustular affection, appearing chiefly about the period of puberty in both sexes, occurring as small, isolated pustules, with hard, deep-red bases, leaving circumscribed, indolent, and hard tumours, and seated chiefly in the sebaceous follicles, most frequently of the face, neck, shoulders, and breast. — *Spec.*: 1st. *A. simplex*; — 2d. *A. indurata*; — 3d. *A. rosacea*. (*See art.* Acne)

59. Genus xii.—Furunculus.— Inflammation limited superficially, but extending to all the cutaneous tissues and subjacent cellular substance, forming a hard, conical tumour, of a dull red colour, varying from the size of a pea to that of a pigeon's egg, terminating in suppuration, with the evacuation of a membranous slough, or of the membrane that inclosed the matter. — *Spec.*: 1st. *F. vulgaris*; — 2d. *F. asthenicus*; — 3d. *Hordeolum*, or *Stye*.

60. Genus xiii. — Carbunculus. — Circumscribed, hard, round, and painful swelling, seated in the cellular tissue of the skin and the subcutaneous tissue; at first of a livid red colour, afterwards black, or of a deep livid hue in the centre or throughout, and covered by lenticular vesicles; terminating in gangrene or sloughing. — *Spec.*: 1st. *C. sporadicus*; — 2d. *C. endemicus*; — 3d. *C. symptomaticus*. (*See art.* Furuncular Eruptions.)

61. Order III.—Squamosæ—*Dermatites squamosæ*—*D. serpiginosæ*— *D. chronicæ*—*Serpigines*. — Chronic affections characterised by the production, on the surface of the skin, of inorganic, laminated scales, of a whitish grey colour, dry, friable, and slightly elevated above the skin, which remains red and dry when the scales fall off. They are generally slowly developed, spread, and continue for months, or even for many years. They are not contagious.

62. Genus i. — Pityriasis. — A superficial affection, implicating chiefly the cuticle, characterised by a copious desquamation and renewal of this tissue, and, although it may appear on any part, affecting chiefly parts covered by hair. — *Spec.*: 1st. *P. Capitis*; — 2d. *P. Palpebrarum*; — 3d. *P. Labiorum*; — 4th. *P. palmaris et plantaris*; — 5th. *P. præputialis et pudentalis*; — 6th. *P. versicolor*; — 7th. *P. nigra*. (*See art.* Pityriasis.)

63. Genus ii. — Psoriasis. — *Lepriasis* — Patches of chronic inflammation of the skin, with slight elevations changing into scales, — those of *psoriasis* being of different sizes, with irregular margins, and the centres not depressed; those of *Lepriasis* being more or less rounded, slightly depressed in their centres, and their margins raised

and reddish. — *Spec.*: 1st. *Psoriasis guttata*; — 2d. *P. diffusa*; — 3d. *P. inveterata*; — 4th. *P. lepræformis* — *Lepriasis.* (*See arts.* Psoriasis and Lepriasis.)

64. Order IV. — Hæmatodes — *Sanguineous Exudations.* — Infiltrations of blood in the cutaneous and subcutaneous tissues, generally without manifest elevation of the surface, owing to impaired vital cohesion of these tissues, and of their capillaries, and to alteration of the blood.

65. Genus i. — Purpura. — Small, distinct, purple specks or patches in the skin, attended by languor and debility, generally without fever. — *Spec.*: 1st. *P. simplex*; — 2d. *P. hæmorrhagica*; — 3d. *P. urticans*; — 4th. *P. symptomatica vel associata* — of exanthematous and continued fevers. — (*See art.* Purpura.)

66. Genus ii. — Scorbutus. — The appearance of patches or blotches of a livid, reddish, or purplish hue, chiefly on the lower limbs, with swelling and bleeding of the gums, great debility, and pains, and contractions of the lower extremities, &c. — *Spec.*: 1st. *S. sine Febre*; — 2d. *S. febrilis.* (*See art.* Scurvy.)

67. Genus iii. — Petechiæ — *Ecchymoses.* — Small spots, generally of a reddish colour, but often livid, violet, or blackish, scattered over the surface of the skin, sometimes resembling flea-bites, or small freckles, remaining a longer or shorter time, varying from an imperceptible point to the size of a hempseed, occurring with or without fever, but most frequently in the advanced stages of adynamic fever. — *Spec.* 1st. *P. primariæ, vel P. sine Febre*; — 2d. *P. secundariæ.*

68. Order V. — Exanthemata — Febres Exanthematicæ — Dermatites Exanthematicæ — Eruptions of various kinds, preceded by fevers of specific natures and fixed durations, the eruptions being generally also of determinate durations, spreading by infection and contagion, or by both — by specific contaminating miasms, or animal poisons, and generally affecting the œconomy only once. (*See arts.* Exanthematous Diseases and Infection.)

69. Genus i. — Rubeola — Morbilli — *Measles.* — Fever, with frequent sneezing, coryza, redness of the eyes, lachrymation, followed generally on the fourth day by a crimson rash, consisting of stigmatised dots, slightly elevated, on the face, neck, breast, and trunk, usually desquamating on the seventh, occurring frequently epidemically, spreading by infection, and affecting the system only once. — *Spec.*: 1st. *R. vulgaris*; — 2d. *R. complicata*; — 3d. *R. maligna*; — 4th. *R. sine Catarrho*; — 5th. *R. sine Exanthemate.* (*See art.* Measles.)

70. Genus ii. — Scarlatina — *Febris Scarlatinosa* — A continued fever, on the second or third day of which, a scarlet efflorescence generally appears on the fauces, face, and neck, spreading over the body, terminating in desquamations from the fifth to the seventh day, frequently attended by affection of the kidneys, and followed by dropsy; often occurring epidemically, propagated by infection, and attacking the system only once. — *Spec.*: 1st. *Scarlatina Hominum.* — *Var.*: *a. S. simplex*; — *b. S. anginosa*; — *c. S. maligna*; — *d. S. sine Exanthemate*; — *e. S. latens.* (*See art.* Scarlet Fever.) *Spec.*: 2nd. *Scarlatina rheumatica, vel S. r. epidemica* (*see art.* Scarlatina Rheumatica); — 3d. *Scarlatina Equi*[*], *vel S. Equi epidemica*; — 4th. *Scarlatina Canis.*

71. Genus iii. — Febris Exanthematica — *Typhus* — *Typhus exanthematicus.* — Typhoid, low, or adynamic fever, attended by stupor, vertigo, confusion of ideas, delirium, or typhomania; by a reddish, papillar eruption on the trunk of the body and limbs; propagated by infection, appearing epidemically, and seldom affecting the system a second time. — *Spec.*: 1st. *F. Typhoides*; — 2d. *Typhus contagiosus.* (*See art.* Fever, Typhoid and Typhus, §485 *et seq.*)

72. Genus iv. — Variola — Small-Pox. — Fever, commencing with shivering, and, after forty-eight hours, or three days, attended by an eruption of red points, passing successively into pimples, acuminated vesicles, flattened and umbilicated vesicles, pustules, and hard brown scabs; ceasing on the development of the eruption, and returning when the eruption has reached its acme, or from the eighth to the eleventh day; the falling off of the scabs, from the twelfth to the twenty-fourth day, leaving behind them dark pits or marks; highly contagious, and affecting the system only once. — *Spec.* 1st. *Variola Hominum.* — *Var.*: *a. V. discreta*; — *b. V. confluens*; — *c. V. sine Variolis.* — *Spec.* 2d. *Variola Animalium.* — *Var.*: *a. V. vaccina*; — *b. V. ovilis, vel Clavus.* — *Spec.* 3d. *V. varioloidea, vel Variola Hominis anomala.* (*See arts.* Small-Pox and Vaccination.)

73. Genus v. — Varicella — *Chicken-pox.* — an eruption of semi-transparent, glabrous vesicles, with red margins, following and attended by a slight attack of fever; the vesicles seldom passing into suppuration, but breaking on the third or forth day, concreting into small puckered scabs, and leaving no cicatrices; affecting a person only once. — *Spec.*: 1st. *V. lentiformis*; — 2d. *V. coniformis*; — 3d. *V. globularis.* (*See art.* Chicken-Pox.)

74. Genus vi. — Miliaria — *Sudamina.* — An eruption of whitish or pale reddish vesicles, the size of a millet-seed, in the course of severe infectious fever; the vesicles being distinct, containing a serous fluid, of a whitish, or reddish, or purplish hue, bursting in two or three days, and terminating in a scurfy desquamation. — *Spec.*: 1st. *M. simplex*; — 2d. *M. abnormis.* (*See art.* Miliary Eruptions.)

75. Genus vii. — Erysipelas. — Asthenic inflammation of the integuments, consequent upon febrile disorder and a morbid state of the blood, affecting the skin or scalp more or less extensively, with a diffused swelling disposed to spread, propa-

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[*] I have lately had reasons, indeed evidence, for the following inferences: — 1st, That Scarlatina was originally a disease of the horse; and that it formerly occurred, and has even recently occurred, epidemically, or as an epizooty among horses; 2d, That it was communicated in comparatively modern times from horses to man; 3d, That it may be, and has been communicated also to the dog.

Whilst this article was passing through the press, and after the preceding part of this note was printed, Mr. Percival, Veterinary Surgeon to the 1st Regiment of Life Guards, and author of the very able and well known work on the Diseases of the Horse, kindly furnished me with additional evidence in support of the opinion I have stated at this place, and when treating of Scarlet Fever. (*See that article*, §§ 90., &c.) Mr. Percival also referred me to the second volume of his work, where Scarlatina in the Horse is mentioned.

gated by infection when circumstances favour the operation of the poisonous miasm. — *Spec.:* 1st. *E. simplex;* — 2d. *E. complicatum.* (*See art.* Erysipelas.*)

76. Order VII. — Dermatites contagiosæ — D. specificæ contagiosæ — Aischrodes — *Eruptiones contagiosæ* — *Contaminating Eruptions.* — Eruptions propagated by direct or mediate contact, of indeterminate, but generally prolonged duration, often contaminating the whole frame; and certain of them tending to fatal terminations.

77. Genus i. — Scabies — *Itch.* — An eruption of distinct, slightly acuminated vesicles, attended by constant itching; the eruption varying in character, but often concealing a parasite or *acarus*, either causing, or produced by it, unattended by constitutional disturbance. — *Spec.* 1st. *S. Hominis;* — *Var.: a. S. H. vesicularis;* — *b. S. papuliformis;* — *c. S. lymphatica;* — *d. S. purulenta;* — *e. S. cachectica.* — *Spec.* 2d. *Scabies Canis.* (*See art.* Itch.)

78. Genus ii. — Sycosis — *Mentagra.* — A pustular eruption of a pale yellow colour, seated chiefly in the hairy parts of the face, as the chin, upper lip, cheeks, &c., affecting the hair follicles and connected tissues, bursting in the course of some days, and producing brownish crusts, which after one or two weeks leave indolent purplish tubercles; the pustules being renewed in different parts, thus continuing for an indeterminate period, and apparently propagated by a parasitic plant, or cryptogamic formations. — *Var.:* 1st. *S. simplex;* — 2d. *S. contagiosum.* (*See art.* Sycosis.)

79. Genus iii. — Favus — Tinea — *T. maligna* — *Porrigo* — *Ring-Worm.* — A specific chronic inflammation, seated chiefly in the hair-follicles, exuding a peculiar yellowish substance, which accumulates and forms a cup around the base of each hair, the aggregation of a number of these resembling the cells of a honey-comb The hair of the diseased follicles is altered, imperfectly nourished, and falls out; and if the disease be not arrested, the subjacent tissues become affected. This contaminating eruption is usually seated in the scalp, sometimes extending to the face, neck, and other parts of the body, and is communicable to any part of the skin. — *Var.:* 1st. *F. dispersus;* — 2d. *F confertus.* (*See art.* Tinea.)

80. Genus iv. — Pustula Maligna — *Contagious Anthrax.* — A large vesicle filled with a sanious fluid, seated over a lenticular induration, which is speedily surrounded by an erysipelatous areolar swelling, which soon becomes gangrenous, and contaminates the circulating fluids; caused by the contact of a septic animal poison, and communicable from person to person, and from the lower animals to man. — *Spec.:* 1st. *P. M. Hominis;* — 2d. *P. M. Animalium.* (*See art.* Pustule, Malignant.)

81. Genus v. — Glanders† — Farcy — *Farcy-Glanders.* — Fever of a low and malignant character, attended by chancry sores of the membrane of the nose, and a profuse, offensive discharge, and by pustular eruptions, or tubercular, gangrenous ulcers, in various parts of the cutaneous surface, produced by the contact of the poisonous matter. — *Spec.:* 1st. *Simple Acute Glanders;* — 2d. *Acute Farcy Glanders;* — 3d. *Simple Chronic Glanders;* — 4th. *Chronic Farcy Glanders.* (*See art.* Glanders.)

82. Genus vi. — Syphilis — *Syphilitic Eruptions* — *Venereal Eruptions.* — A distemper contracted, generally by impure contact, and characterised, externally, by copper-coloured spots, or by pustules, vegetations, excrescences, ulcerations, swellings, tumours, or imposthumes; internally, by pains in the bones or periosteum, or by caries. — *Spec.* 1st. *S. eczematosæ.* — *Var.: a. lenticularis;* — *b. papularis; c. vesicularis;* — *d. pustularis;* — *e. tubercularis.* — *Spec.* 2d. *S. squamosa.* — *Var.: a. Leprosa;* — *Psoriasis.* — *Spec.* 3d. *S. vegetans.* — *Var.: a. verrucosa;* — *b. Condyloma;* — *c. Cauliflora;* — *d. Frambœsia;* — *e. Crista-Galli.* — *Spec.* 4th. *S. exulcerans.* — *Var.: a. serpiginosa;* — *b. fissata;* — *c. excavata.* (*See art.* Syphilitic Affections.)

83. Genus vii. — Mycosis. — A contagious disease, consisting of fungous excrescences, occurring chiefly on the face, hairy scalp, or about the organs of generation, resembling a mulberry or strawberry, exuding a yellowish, fœtid, and viscous humour, sometimes forming tumours of considerable size, and often attended by pains in the bones, by hoarseness, coryza, or ozœna, ulceration of the tonsils, &c. — *Spec.:* 1st. *M. Frambesioides, Frambœsia;* — 2d. *M. Molluscum, Ambogna-pox;* — 3d. *M. syphiloides, Sibbens,* &c.

84. Order VIII. — Leprodes — *Leprous Eruptions.* — Morbid degenerations of the skin, depending upon constitutional vice, attended by diminution of the sensibility of the diseased surface, by general hypertrophy of the cutaneous tissues, by originating in endemic influences and bad food, insensibly and slowly, and by their very prolonged duration and hopeless cure.

85. Genus i. — Lepra Tuberculosa — Leprosy — *Leprosy of the middle ages* — *Lepra Hebræorum.* — Dusky-red or livid tubercles, of various sizes, on the face, ears, and extremities; a rugous and thickened state of the skin, impaired sensibility and falling out of the hair, excepting on the scalp; hoarse or altered voice, and ozœna; terminating in ulcerations of the affected surface, and extreme fœtor; the distemper being often hereditary, and even contagious by means of the matter discharged from the sores. — *Spec.:* 1st. *Lepra Taurica* — the Leprosy of the Crimea; — 2d. *L. anæsthesiaca;* — 3d. *L. Hebræorum* — Jewish or Egyptian Leprosy. (*See art.* Leprosy.)

86. Genus ii. — Radesyge. — Lassitude, torpor, and heaviness of the limbs, stiffness and pains of the joints; a pale, bloated, leaden, or reddish appearance of the face, hoarseness of the voice, ozæna; a rugous, scaly, and callous state of the skin, especially in parts, followed by cracks, furrows, tuberculous callosities, and ulcers. — *Spec.:* 1st. *R. vulgaris;* — 2d. *R. scorbutica.*

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* The several forms and states of complication manifested by *Erysipelas* are fully described, in the article referred to, as they have been observed in many countries and climates by the author, and during different epidemic constitutions.

† This malignant and contaminating distemper is generated in horses from crowding, and from breathing a contaminated or foul air, and is communicated from them to man. There is great reason to believe, that most, if not all the maladies comprised under this order, have originated in some of the lower animals, and have extended, with various modifications, to man; and not improbably small-pox has had a similar origin as well as scarlet fever, as already mentioned.

87. Genus iii. — Elephantia — *Elephantiasis of the Arabians.* — Hardness, lividity, and great tumefaction of one or both limbs, or of the scrotum, owing to great thickening of the cutaneous and subcutaneous tissues, with an irregular, glabrous, or scaly state of the surface; endemic chiefly in warm countries. — *Spec.:* 1st. *E. vulgaris*; — 2d. *E. tuberosa*; — 3d. *E. Scrotalis.* (*See art.* Elephantiasis.)

88. Genus iv. — Pellagra. — An endemic and hereditary malady, characterised by thickening, scaly excoriation, cracks, and deep fissures of those parts of the skin exposed to the sun or air; attended by general cachexia, by burning pains in the trunk and limbs, by disorder of the digestive organs and nervous system; at first appearing after prolonged intervals, afterwards being more continued, and often fatal. — *Spec.:* 1st. *P. Milanensis*; — 2d. *P. Asturiensis.* (*See art.* Pellagra.)

89. Genus v.—Icthyosis. — Morbid enlargement of the papillæ of the skin, and thickening of lamellæ of the epidermis, either in parts, or more or less generally, presenting irrégolar compartments often resembling the scales of fish. — *Spec.:* 1st. *I. hereditaris*; — 2d. *T. papillaris*; — 3d. *I. localis.* (*See art.* Ichthyosis.)

90. Order IX. — Cancrodes — *Cancerous Distempers.* — Cancerous diseases of the skin are characterised by their slow and insidious attack; by their prolonged duration; by their foul ulceration and lancinating pains; by their resistance to treatment, and by their general return to adjoining or remote parts, after removal by excision: they depend on a peculiar diathesis, which is often hereditary.

91. Genus i. — Lupus — *Cancer Lupus*, Sauvages. — A disease of all the tissues of a portion of the skin, chiefly of the face, implicating also the subjacent cellular substance; of remarkably slow progress and long duration; always extending either superficially or in depth, with a stinging sensation of heat; passing into ichorous and slow phagedenic ulceration, and destroying the textures to which it extends. — *Spec.:* 1st. *L. superficialis*; — 2d. *L. phagedænicus*; — 3d. *L. non-exedens serpiginosus.* (The different species of Lupus form the connecting links between the *leprous* and the *cancerous* diseases of the skin. *See art.* Lupus.)

92. Genus ii. — Carcinus. — An alteration of all the tissues of the skin and subjacent cellular tissue, generally commencing as a small, hard, indolent tumour, with itching or stinging; passing into pungent or lancinating pains, and often attended or followed by ichorous and slow ulceration, and by general contamination of the frame. — *Spec.:* 1st. *C. scirrhosus, — Carcinoma*; — 2d. *C. verrucosus* (Chimney-Sweeps' Cancer): — 3d. *C. medullaris*; — 4th. *C. melanæus*; — 5th. *C. eburneus.* (*See arts.* Cancer and Scirrhous and other Tumours.)

93. Genus iii. — Kelis. — A prominent, hard excrescence, sometimes cylindrical, sometimes round or square, flattened in the centre and elevated at the margin, projecting roots into the skin. — *Spec.:* 1st. *R. genuina*; — 2d. *R. spuria.*

94. Order X. — Heteromorphæa. — Alterations of the skin, cuticle, or nails, not comprised under the foregoing, nor referable to changes or morbid actions similar to, or allied with, those which characterise the preceding groups.

95. Genus i. — Nævus — *Vascular Nævi — Moles.* — A congenital alteration of a portion of the skin, consisting either of a convoluted congeries of capillary vessels, more or less elevated, in the form of a small vascular tumour, above the surface, or of a more diffused and dark or livid-coloured patch, or of a warty, hairy, or discoloured elevation or excrescence. — *Spec.:* 1st. *N. vascularis circumscriptus*; — 2d. *N. vascularis diffusus*; — 3d. *N. non-vascularis*; — 4th. *N. pilosus.*

96. Genus ii. — Verruca — *Warts.* — A very circumscribed, hard, excrescence, sessile or pedunculated, sometimes moveable, sometimes more fixed, of nearly the same colour as the skin, its surface being rugged, horny, or hard, and not susceptible of inflammation, although the cutaneous papillæ to which it is attached is more than usually vascular. — *Spec.:* 1st. *V. vulgaris*; — 2d. *V. Acrochordon.*

97. Genus iii. — Tylosis — *Corns* — Circumscribed, dry, hard, lamellated callosities, owing to hypertrophy of the cuticle from pressure, which drives the altered structure inwards upon the subjacent tissues, developed chiefly on the toes. — *Spec.:* 1st. *T. indurata*; — 2d. *T. gomphosa*; — 3d. *T. bulbosa.*

98. Genus iv. — Onygosis. — Inflammation with swelling, redness, and pain of the matrix of the nail, causing malformation, induration, eversion, or inversion of the nail. — *Spec.:* 1st. *O. acuta*; — 2d. *O. chronica*; — 3d. *O. cum Inversione*; — 4th. *O. cum Eversione*; — 5th. *O. complicata vel associata.* (Often associated with *Psoriasis* and *Lepriasis*, which see § 23.)

99. Having exhibited what may be considered a strictly *natural grouping* or *classification* of the changes, appearing either primarily in the tissues of the skin, or contemporaneously with, or consecutively upon, febrile and constitutional diseases, it will be seen that the local connections, the symptomatic relations, and the more prominent features and alliances of these changes, are brought more completely and more accurately under view. And it will be more clearly perceived, that these affections of the skin, so difficult to arrange, and so generally considered and treated as local alterations merely, are more or less important manifestations, in the cutaneous tissues, of disordered or diseased conditions of one or more of the vital functions, — of the organic nervous influence or energy, of the digestive and assimilating functions, of the depurating or eliminating functions, and, consequently, of the circulating fluids, and of the constitution or frame in general. Thus, a natural arrangement of cutaneous affections directs the attention more entirely to the relations, and constitutional and visceral dependencies, of these affections, and leads to rational and successful methods of cure; most of the affections grouped under the same order manifesting such morbid relations and connections, as require similar indications and means for each.

100. As *artificial arrangements of cutaneous diseases* have been so commonly received, and as they tend to facilitate diagnosis, I shall conclude this subject by giving the improved modification of the classification of Willan, by M. Rayer; the arrangement of Willan being itself only a modification of that originally published by Plenck.

TABLE.

- **DIVISION I.** Diseases of the Skin.
  - **Chapter I.** Inflammatory Affections, distributed according to the Number and Form of their elementary Lesions.
    - **Section I.** Having a single elementary Form.
      - 1. Exanthemata.—Erythema, Erysipelas, Rubeola, Roseola, Scarlatina, Urticaria; Artificial Exanthemata.
      - 2. Bullæ. — Pemphigus, Rupia; Artificial Bullæ — Blisters, Ampullæ.
      - 3. Vesiculæ. — Herpes, Eczema, Hydrargyria, Scabies, Miliaris sudatoria (*suette miliaire*), Sudamina; Artificial Vesicles.
      - 4. Pustulæ. — Variola, Varicella, Vaccinia, Vaccinella, Acne, Rosacea, Sycosis, Impetigo, Favus, Ecthyma; Artificial Pustules.
      - 5. Furunculi. — Hordeolum, Furunculus, Anthrax.
      - 6. Gangrenæ. — Anthracion vel Pustula maligna, Anthrax Pestis.
      - 7. Papulæ. — Strophulus, Lichen, Prurigo; Artificial Papulæ.
      - 8. Squamæ. — Pityriasis, Psoriasis, Lepra, Pellagra; Artificial Squamæ.
      - 9. Tubercula. — Lupus, Scrofula, Cancer; Elephantiasis Græcorum; Artificial Tubercles.
    - **Section II.** Having several elementary Forms.
      - 1. Syphilis.
        - Exanthematica, Bullosa, Vesiculosa, Pustulosa, Squamosa, Papulosa, Tuberculosa, Vegetativa.
      - 2. Ambustio.
        - Exanthematica, Bullosa, Gangrenosa.
      - 3. Pernio.
        - Exanthematica, Bullosa, Gangrenosa.
  - **Chapter II.** Peculiar States of the Skin not referable to Inflammation.
    - Anæmiæ.
    - Congestus sanguinei.
    - Hæmorrhagiæ.
      - Purpura (Petechiæ, Vibices, Ecchymoses, Dermatorrhagia).
  - **Chapter III.** Morbid States of the secreting Functions of the Skin.
    - Perspirationis Ephidrosis.
    - Epidermidis Exfoliatio.
  - **Chapter IV.** Neuroses of the Skin.
    - Anæsthesia, Hyperæsthesia.
  - **Chapter V.** Faulty Structure, or unusual States of one or other of the Elements of the Skin.
    - Pigmenti (Achromata; Dyschromata).
      - Albinismus seu Leucopathia, Nigrities, Ephelis, Lentigo, Chloasma, Melasma, Nævus pigmentarius, Color cæruleus, Color subflavus; Artificial Discolorations.
    - Hypertrophiæ.
      - Papillarum et Epidermidis.
        - Ichthyosis, Verruca, Producta cornea, Tylosis.
      - Vasorum Cutis.
        - Phlebectasia, Angiectasia capillaris, Nævus araneus flammeus, &c. Tumor vascularis.
      - Corii, Membranæ cellularis subcutaneæ, et Telæ adiposæ.
        - Cheloidea, Tumores varii, Elephantiasis Arabica, Andrum, et Pedarthoræ, Barbadoes Leg, &c.
    - Gangræna simplex.
    - Cicatrices.
    - Defectus congenitus Cutis.
    - Extensio vel Relaxatio insolita Cutis.
  - **Chapter VI.** Degenerations.
    - Degenerationes fibrosæ.
    - Melanosis.
    - Degenerationes tuberculosæ.
- **DIVISION II.** Alterations of the Dependencies of the Skin.
  - **Chapter I.** Special Diseases of the Sebaceous Follicles.
    - Secretio aucta, Vermes sebacei, Levatio follicularis, Tumor follicularis, Calculi Folliculorum.
  - **Chapter II.** Special Diseases of the Piliferous Follicles.
    - Atrophia, Defectus congenitus Pilorum, Pili supernumerarii; Incrementum insolitum Pilorum, Coactio Pilorum, Alopecia, Canities, Plica.
  - **Chapter III.** Special Diseases of the Unguial Matrices and Alterations of the Nails.
    - Onychia, Vitia Conformationis et Structuræ Unguium; Ecchymosis subungualis; Incrementum insolitum Unguium; Situs insolitus; Ficus; Defœdatio, Degeneratio; Productio et Reproductio, &c.
- **DIVISION III.** Foreign Bodies on the Surface, under, or in the Substance of the Skin.
  - Parasitic Insects infecting the Skin of Man.
    - Pediculi; Pulices; Acarus Scabiei; Fillaria medinensis; Œstrus.

101. I may further add the arrangement proposed by Professor J. H. Bennett, of Edinburgh. He excludes from the orders *Exanthemata* and *Pustulæ* the diseases characterised by excessive fever, as being essentially febrile. From the order *Vesiculæ* he also removes miliaria and varicella, for a similar reason; and he expunges the order *Bullæ* altogether. With some other alterations, consisting chiefly of reductions of genera to the rank of species, he assigns the following as his classification of skin-affections. It will be seen that it is a modification, with several omissions, of the arrangement generally adopted *of diseases of the skin*; whilst in that which I have given above, I have comprised also the principal of those maladies which generally also *affect or implicate the skin* in a more or less obvious manner:—

Order I. *Exanthemata.*
- Erythema.
- Roseola.
- Urticaria.

Ord. ii. *Vesiculæ.*
- Eczema.
- Herpes.
- Scabies.
- Pemphigus.

Ord. iii. *Pustulæ.*
- Impetigo.
- Ecthyma.
- Acne.
- Rupia.

Ord. iv. *Papulæ.*
- Lichen.
- Prurigo.

Ord. v. *Squamæ.*
- Psoriasis.
- Pityriasis.
- Icthyosis.

Ord. vi. *Tuberculæ.*
- Lepra tuberculosa.
- Lupus.
- Molluscum.

Ord. vii. *Maculæ.*
- Lentigo.
- Ephelides.
- Nævi.
- Purpura.

Ord. viii. *Dermatozoa.*
- Entozoon folliculorum.
- Acarus.
- Pediculus.

Ord. ix. *Dermatophytæ.*
- Porrigophyte (Favus).
- Mentagraphyte (Mentagra).

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(Gives this, the earliest, diagnosis between Small-pox and Measles: "*Variolis*, at an early period, presents an eminence or elevation above the surface: *Morbillus* is less elevated than variola, and approaches the eye less; it is attended by more lachrymation and less pain of the back." He distinguishes also between Scabies and Prurigo.) — *Avenzoar*, De Rectificatione et Facilitatione Medicationis et Regiminis, fol. Venet. 1549. (The first to mention the *Acarus Scabiei*.) — *Theodorici* Chirurgia, fol. 1519. — *Gilbertus Anglicanus*, Laurea Anglicana seu Compend. totius Medicinæ, 4to. Lugd. Bat. 1510. (Described the Leprosy of the Middle Ages). — *Torella*, De Pudendagra Tract. &c. in Aphrodisiacus *Luisini*, fol. Lugd. Bat. 1728. — *Fracastorius*, Syphilis, sive de Morbo Gallico, libri tres. 4to. Veronæ, 1535., et De Morbis Contagiosis, lib. ii. cap. 15. 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SLEEP AND SLEEPLESSNESS. — CLASSIF.: — GENERAL PATHOLOGY—SYMPTOMATOLOGY — THERAPEUTICS.

1. DEFINIT. — i. SLEEP. — *The suspension of sensation and voluntary motion, occurring at periodic intervals, continuing for some hours, then terminating spontaneously, or by some irritation or excitement, being indispensable to the due discharge of all the sensory, intellectual, and voluntary functions.*

ii. SLEEPLESSNESS. — *The non-recurrence of this periodic suspension of sensation and voluntary motion, or the imperfect or interrupted recurrence of it, as a symptom of disease, or as the chief manifestation of disease.*

2. I. SLEEP is necessary to the due discharge of the sensory, intellectual, and voluntary functions, for any considerable period; and if that period be much prolonged beyond eighteen or twenty hours, even during states of excitement or anxiety, an overpowering disposition to sleep is experienced; although powerful constitutions, on trying occasions, may continue awake for much longer periods. The organic functions, or those functions which are actuated by the organic, nervous, or ganglial system, and which consist chiefly of digestion, assimilation, circulation, nutrition, and secretion — all these functions, commonly termed involuntary—require not the suspension or repose constituting sleep, which, if extended to them, would soon terminate life. But these functions are performed — at least, some of them —with less activity during this period. Sleep is not only indispensably requisite to the adequate discharge of the functions performed by the cerebro-spinal nervous system, but is also necessary to the due nutrition of this system — to the due supply of the waste of nervous power, and even of intimate nervous organisation, required for the healthy performance of the functions of this system. Whilst the ganglial nervous system, on the one hand, discharges its functions through the media of the several organs actuated by it almost continuously, and without marked repose or waste of substance or structure, the cerebro-spinal nervous system, on the other hand, demands periodic or alternate repose and action, in order to insure its healthy function and organisation, and to prevent excessive exhaustion and waste.

3. The restoration of cerebro-spinal nervous power consequent upon sleep has been, by some physiologists, attributed to the due nutrition of the cerebro-spinal organs during this period, as much as to the suspension of exhaustion and waste, this restoration and nutrition being requisite in proportion to the antecedent waste, which, if not duly restored, successively increases until the intimate organisation of these nervous centres ultimately undergoes irreparable and tangible change. In early age and during manhood, the voluntary actions and mental exertion may be continued during comparatively long periods without exhaustion, for nutrition, or the restoration of the nervous expenditure, is then more rapid and complete than in advanced or old age; whereas, at this age, these efforts, especially such as are of a very exhausting nature, are followed by a more prolonged and a more urgent want of repose; and if repose be not obtained, disease, or even disorganisation, more especially inflammation, in the earlier epochs of life, and apoplexy and paralysis in advanced age, may speedily supervene. Thus we observe that when, in advanced life, mental exertion, bodily fatigue, or venereal indulgences are carried too far, the disposition to sleep is most urgent, and, if the required repose be not obtained, the risk from the supervention of these maladies becomes great.

4. The seat of consciousness, or of active sensation, has been long since supposed by some writers to be different from that of the mental faculties; and it has been believed that, whilst the former is in the central and basilar parts of the brain, the latter are to be referred to the convolutions of the hemispheres. During sleep, therefore, the more central parts, the seats of sensation, are altogether inactive, or incapable of feeling or perceiving impressions made upon the senses, and thence conveyed to those parts, unless the impressions be so strong as to rouse them to a state of activity: but whilst sleep consists of the inaction or repose of these parts, and of the hemispheric convolutions as well, when sleep is complete or profound, a less profound form of sleep consists of a less complete state of inaction of both the hemispheric convolutions and the central cerebral structures. This latter, or imperfect state of sleep comprises numerous phases or grades from that attended by indistinct *dreams*, through the various states of *dreaming*, until the half-waking and half-sleeping state is reached.

5. During *dreaming*, the structures of the brain more especially concerned in the mental manifestations are not completely or entirely in a state of repose, nor can it be admitted, that the seats of conscious sensation are also completely or profoundly inactive, otherwise the former manifestations could not be perceived or remembered by the latter. It will be, therefore,

more correct to view the several portions of the brain concerned in sensation, mental manifestation and volition, as not completely, although more or less, inactive during sleep, unless the sleep be very deep, and altogether without dreams; for, more frequently, especially when the dreams are distinct, and are recollected upon awakening from sleep, certain parts of the brain continue more or less active, repose not being universal and complete. Dreaming during sleep in health may be rendered more vivid and remarkable by the excitement of the brain during the various mental or physical exertions of the day, or by the nature of the food or drink, or by disorders of the digestive functions, the imagination and reasoning powers being either partially or actively exercised, and the results of these being remembered when waking. This partial or irregular activity of the hemispheric portions of the brain during sleep is often still more strongly manifested during the imperfect sleep of fever, and is even expressed more or less audibly and actively; those suggestions, conceptions, and unconnected ideas, constituting dreams in health, passing into more or less manifest delirium in states of disease. Thus various grades of sleep and of dreaming may exist either occasionally or habitually during the ordinary health of the individual; and thus, during disease, various grades or phases of delirium, passing into sopor, lethargy, and coma, may occur, as the states of nervous power and of the circulation may favour their appearance.

6. During sleep, especially when it is not profound, the sensorium may be influenced in various ways, so as to give rise to changes of position, to various conceptions, and even to acts, without a conscious perception of them. An uneasy position, or the muscular sense, may occasion during sleep a complete change of position, — a person may turn from one side to the other, without being conscious of either the cause or the act of turning. In this case, the uneasiness influences the sensorium, or induces an unconscious sensation sufficient to give rise to a similarly unconscious volition productive of the act, but there is no perception of it. During dreaming, the conception of numerous occurrences, circumstances, and acts, passes through the mind with greater or less rapidity, and generally in a very incongruous and unconnected manner. The various processes of thought which had engaged the waking brain are often partially renewed or suggested during sleep, or while the mind is unconscious of impressions on the senses, frequently in singular forms, or with inconceivable rapidity, or in disjointed or impossible states; these suggestions or conceptions being, however, sufficiently strong, in many cases, to excite conscious sensation, so far, at least, as to be partially remembered on waking.

7. These suggestions seldom amount to perfect conceptions, but are loose and unconnected, generally faintly entertained, and soon extinguished. They are the results of imperfect or disordered states of repose of the parts of the brain more especially concerned in the mental processes. They may occur without any excitement or stimulus of the senses, or of parts distant from the brain, as apparitions merely of anterior processes of thought or of acts, in partial or newly-combined and bizarre forms, without any circumstance which can account for their appearance; and they may assume the most lively characters, and be attended by more or less correct reasoning, and by the highest flights of imagination. But in some instances, they may be referred, with great accuracy, to antecedent occurrences, occupations, or mental processes, of which they are the imperfect or distorted remains or apparitions, although sometimes the most lively or intense, but also the most incongruous conceptions. In other cases they are excited by local impressions, or irritants, or changes which sympathetically affect the brain, so as to give rise to those conceptions which constitute dreams, or even to acts, which those conceptions occasion. Thus the irritation of the bladder may give rise, during sleep, to conceptions connected with micturition, and this act may even follow without waking, although it generally immediately terminates the sleep. Thus, also, irritation of the vesiculæ seminales produces lascivious dreams, and not infrequently is followed by seminal emission. Various internal excitants, moreover, or external agents, acting during sleep, may be followed by dreams having a more or less obvious connection with the causes which produced them; the impressions made by such agents calling up certain related, although incongruous or disjointed conceptions in the sensorium.

8. The conceptions arising in the manner now explained, — either with or without any obvious excitant or physical cause, — may be so slight and evanescent as hardly to be remembered upon awaking, and as not to occasion any change of position, or any act implying volition, of either a conscious or unconscious kind. But not infrequently the conceptions formed during sleep, when lively or active, give rise to volition, and are followed by acts. The individual acts the dream, or performs the conception passing through his mind, without being so conscious of his act as to remember it when he awakes, or when the functions of sense and perception are fully restored. This constitutes *somnambulism*, or sleep-walking, a state of partial or imperfect sleep, which has been sufficiently noticed, in respect of its nature and relations, when treating of *the pathology of* PARALYSIS (see § 193. *et seq.*).

9. *Sleep*, that it may be refreshing and restorative to both body and mind, should, 1st., take place at a stated and proper hour, and after stated intervals; — 2d., continue for a certain period of time, without being prolonged much beyond that time; — 3d., be aided by the necessary preparations to secure ease of position, and to prevent disturbance of the vital and animal functions. When sleep is obtained without these precautions, — when it occurs at unseasonable hours, — when it is broken or unusually shortened, — when it is taken on a loaded stomach, or after the ingurgitation of heating or stimulating beverages, — when the position of the body is unusual, cramped, or uneasy, — when the stomach or bowels are distended by flatulence, or irritated by acidity, — then it is either disturbed or unsound, unrefreshing, — the body and mind are left on waking either languid or torpid, and the requisite exertions or engagements of the following day are entered upon with disrelish, and are soon productive of fatigue.

10. To secure refreshing sleep, a sufficiently early and a punctual period of retiring to repose should be adopted, after having spent a reasonable period in the open air, chiefly in exercise suit-

the state and constitution of the individual. The diet should be digestible and moderate in quantity, and such as will not favour flatulency or acidity. Repose ought not be taken for some hours after a full meal; and the place in which it should be sought ought to be airy and dry, the temperature being not above 70° of Fahr. or below 55°. The bed should be firm and moderately elastic, slightly elevated towards the head, and the clothes, both above and under the person, sufficiently warm and light. All the day-clothes should be taken off. The chamber ought to be large and airy, and light and noise excluded. If air be not sufficiently renewed in the sleeping apartment, sleep becomes feverish or restless, and the individual awakes unrefreshed and uncomfortable.

11. The *amount* of sleep should vary with the age, the occupation, the constitution, and the habits of the individual. During infancy and childhood, prolonged periods of sleep are required for the nutrition of the nervous masses and the growth of the body. Infants sleep the greater part of the twenty-four hours. Children require twelve or fourteen hours; older children, or those from eight years until fourteen or fifteen, about ten hours. From commencing puberty until full growth, or from twenty-five to thirty, eight hours are sufficient. After this age, the duration of sleep should range from six to eight hours, according to the occupations or exertions, mental or physical, of the individual.

12. *The causes of sleep* are not only the fatigue, the exhaustion, and the periodicity characterising all our sensorial actions and manifestations already insisted upon as requiring restoration and reinforcement of nervous power during the periods of repose, but also various states and phenomena which act more or less on the sensorium of those who are either incapable, or not in a situation, of having recourse to those mental or physical operations which more certainly conduce to repose. The entire *absence* of sensorial impressions, or the *monotonous repetition* of such impressions, will frequently occasion sleep, as occurs when listening to a drawling, monotonous reader or preacher, or to distant sounds of unvarying loudness. Persons who have become accustomed to sleep, notwithstanding the continuance of sounds which would keep the unaccustomed awake, frequently cannot sleep when deprived of these sounds, or when removed to perfect stillness, or when they are within the reach of sounds of a different intensity or key. Friction of various parts, especially in nervous or susceptible persons, prolonged combing of the hair, monotonous sounds of any kind, continued and gentle motions of the body in the same directions, rapid transport of the body backwards, or with the back placed towards the place where the body is carried, as when thus seated in a carriage, or on a railway, and directing the mind to uninteresting objects or matters, severally induce sleep, especially when other circumstances concur in causing this effect. There are, moreover, other causes which produce sleep, and which may be viewed as pathological, inasmuch as they are more or less morbid in their consequences or nature: they require merely enumeration. Venereal excesses may occasion sleep, lethargy, or sopor, especially in the aged; extreme exhaustion of the organic nervous and cerebro-spinal energies; a plethoric state of the brain, or of the vascular system generally; the superabundance of excrementitious materials in the blood, or an imperfect oxidation of this fluid; the administration of narcotising substances; and various related morbid affections induce sleep, either excessive as respects its continuance, or of a disordered or unrefreshing kind (see *art.* COMA and LETHARGY).

13. *The accession of sleep* is very different in different persons, or when sleep supervenes naturally and healthily, and when it is induced artificially, or assumes more or less of a disordered character. Healthy sleep may occur either suddenly or gradually. Disordered sleep is generally slow and partial in its accession. The sensorium gradually loses its control over the current of the ideas, which becomes unconnected and incongruous; and in this state of transition, — of half sleeping and half waking, — a dreamy, or even a delirious existence is passed for a longer or shorter period, until an entire loss of sensibility of external objects, — a more complete torpor of the sensorial parts of the brain, — supervenes, and sounder sleep is induced. The disposition to, and indisposition from, sleep are very much in the power of the individual, for, by abstracting the mind from all objects of sense, and from the suggestions or ideas they excite, by ceasing every phase or mode of volition, and by ceasing to think upon or respecting any topic requiring mental exertion, or calculated to occasion mental excitement, or by directing the attention to, and fixing it on, a single, uninteresting, unexciting, or simple object, and engaging the thoughts with no other, the sensorium will soon lapse into that state of torpor productive of sleep.

14. The accession of sleep is often *attended by various morbid phenomena*, especially in persons predisposed or subject to any nervous, or spasmodic, or paralytic affection. These consist chiefly of startings, twitchings, contractions, or cramps, of one or more limbs or muscles; of convulsions and spasmodic laryngeal disorders, or croup, in children; of epileptic fits, more or less complete, or merely slight or partial, and even of various mental and spectral illusions. Any of the foregoing may occur upon the accession of sleep, and before sleep has become complete, or immediately upon falling asleep; or during the commencement of sleep, when sensation is partially or suddenly excited by any excitant, or disturbing cause.

15. *Awakening* from sleep may be either sudden or gradual. The healthy and sufficiently sound and prolonged sleep terminates spontaneously and immediately, leaving the person who has enjoyed it refreshed and active; or if it be terminated by impressions made upon the senses, these impressions produce this effect readily and completely, — an effect not observed from them when the sleep is of that morbid kind which constitutes lethargy, stupor, sopor, or coma, in its several morbid grades. Disordered, unsound, or insufficient sleep generally passes into that state of half sleeping and waking noticed above (§ 4.), and, according to the circumstances causing the disorder or unsoundness, is attended by the dreamy, or even by the delirious states of temporary existence just mentioned, until stronger impressions on the organs of sense, or diminished torpor of the sensorium, — the increased activity of the sensorial or conscious portions of the brain, — are followed by

the restoration of the several manifestations or functions of this organ.

16. *Sleep may be excessive.* — 1st. As respects its duration. — 2d. As regards its profound character, and the difficulty of arousing the person from it; and 3d. In the frequency of its recurrence. These are diseased states, and either amount to one or other of those described under the heads COMA and LETHARGY, or generally pass into one or other of them, if not soon arrested by a treatment appropriate to the exciting and pathological causes which occasion them. Too profound or prolonged sleep should always excite suspicions of a disposition to, or the actual presence of, cerebral congestion, owing either to nervous exhaustion, or to a morbid state of the cerebral circulation, or to an interrupted return of blood from the brain, occasioned by pulmonary or cardiac engorgements, or to a morbid state of the blood itself. To one or other of these morbid conditions, excessive or deep sleep, especially when amounting to lethargy or sopor, may be imputed, the existence of either condition, or of more than one, generally becoming manifest upon a careful examination of the case.

17. II. SLEEPLESSNESS — *Wakefulness* — 'Αγρυπνία — *Insomnia* — *Pervigilium* — is a symptom of disease, but it sometimes is also a forerunner of the worst forms of disease, or occurs before any very obvious disorder can be recognised. An interrupted sleep, or a more or less incomplete form of wakefulness — states of partial sleeplessness — may occur in consequence of too varied or too anxious states of mental occupation, or of the use of various beverages, or indigestible articles of food, near the period of repose, which prevent the accession of sleep, as green tea, coffee, &c. But when it is not induced by any of these causes, and even when the wakefulness occasioned by them is complete, it should be considered as a most important symptom, and its pathological cause ought to be carefully investigated. *Wakefulness* may be either *partial* or *complete*: the former may be so frequent as to be habitual, or merely occasional; the latter cannot be of long continuance without being followed by dangerous disease.

18. i. *Partial or incomplete sleeplessness* is of frequent occurrence, especially in persons whose minds are much and anxiously engaged, or whose occupations subject them to great mental exertion, or to the vicissitudes of fortune. It may likewise follow the unreasonable indulgence of grief, severe losses of any kind, and the numerous vexations and disappointments of life. When it is continued nightly for a long period, it may superinduce serious disease of the brain, or of the heart, or some other organ, as the cause of the wakefulness may operate upon the frame; the nature of the cause having a more or less special influence upon either the brain, heart, lungs, liver, &c., according to the susceptibility or predisposition of these organs. Partial insomnia is often occasioned by sleeping with too many clothes on the bed, or by the use of curtains to the bed, and to the closeness with which they are drawn, or by an insufficient renewal of the air in the sleeping-chamber. These causes, especially the breathing of an impure or self-contaminated air, induces a febrile state, attended by headache, restlessness, and more or less complete pervigilium, the tongue and mouth being foul and clammy in the morning, and the person unrefreshed, or even much more fatigued and disordered than when repose was sought.

19. Partial sleeplessness has always a most intimate relation to the states of morbid action, and, according to these states, is attended by peculiar features. The sleeplessness may be occasioned, or the sleep may be broken, interrupted, or unsound, by indigestion, flatulence, or acidity of the stomach or bowels, or it may be disturbed by cramps or spasms of various muscles. This association is often observed in gouty and dyspeptic persons: the irritation of the prima via by flatus, acidity, or undigested articles, disorders the ganglionic nerves, and, through the medium of them, disturbs the sleep, excites the brain and spinal chord, the irritation thus extended to these centres being, in some cases, reflected from them to one or more of the muscles of voluntary motion, occasioning spasm or cramp. When wakefulness proceeds from the disordered digestion consequent upon indigestible articles of food, or upon an overloaded stomach, there is not merely more or less restlessness, but also often a feeling of oppression, a disposition to sleep, which, when it takes place, is generally attended by disturbing or fearful dreams, or by the nightmare, the individual waking up in fright, with a dry mouth and excited pulse.

20. When this state of sleeplessness is occasioned by mental exertion, or by continued mental rumination, when retiring to rest, on the subjects which have just before engaged the mind, whether these subjects be abstract or emotional, — whether they be intricate or difficult in their nature, or calculated to perpetuate anxiety or distress, — then feverishness, headache, restlessness, thirst, &c., are apt to occur, and to render sleep, when it at last takes place, unquiet, disturbed by dreams, and unrefreshing. In some cases of this kind, more especially, the person often dreams aloud, and, in rare instances, particularly when there is much nervous susceptibility and mental activity, he *acts his dream*, and evinces a more or less complete state of *somnambulism*, or *sleep-walking*. A youth, whom I knew, was much engaged in becoming an accomplished player on the flute; his dreams had frequent reference to this study, and he often disturbed the family by his performances on this instrument during his sleep. I was called one night to a young lady, who had disturbed and alarmed her relations by walking through more than one of her apartments in her night-dress, singing some songs she had been recently practising. And another young lady, whom I saw on this account, sometimes left her chamber in her sleeping-dress, and sat down to the piano in another room and performed some pieces of music which she had been learning. Females, who are somnambulists, generally first evince this disorder either at the period of puberty, previously to, or about, the accession of the catamenia, or where this discharge is interrupted or otherwise deranged.

21. Persons labouring under disease of the substance or valves of the heart, are subject not only to imperfect and disturbed sleep, but also to fearful dreams; and if they fall asleep in an uneasy position, or on the left side, in some cases, they generally waken up soon after from a fearful dream, as falling from a precipice, drowning, &c.; their dreams being more pleasant when the position is more comfortable. The same phenom-

are often observed in dyspeptic subjects, when the stomach or colon is distended by flatus; for, when the individual lies on the left side, the weight of the body presses on it, whilst the liver presses on the stomach and colon, and the flatulent distension of these pushes the diaphragm upon the heart, and embarrasses the circulation through this organ.

22. There are very few chronic diseases of which partial wakefulness is not a symptom; but it is more especially distressing in atonic gout, rheumatism, affections of the skin, and disorders of the urinary organs. Anomalous states of hysteria, the several forms of dyspepsia, and derangements of the functions of digestion, are, as well as the foregoing, attended by partial wakefulness, or by a disturbed, insufficient, and unrefreshing sleep. Certain beverages and articles of diet may be the chief cause; and when these are relinquished, the sleep becomes more sound. Tea, especially green tea, coffee, and spirituous liquors, often occasion wakefulness; and a full meal of animal food, especially of pork, late in the day, often causes either restlessness, loss of sleep, or disturbing dreams. It would be unprofitable, as it is unnecessary, further to notice the contingent occurrence of want of sleep in chronic diseases, as it is very generally observed and readily accounted for.

23. ii. *Complete sleeplessness* is often a most important symptom of disease, and when it occurs without any manifest physical disorder to account for its existence, it should be viewed as the forerunner of dangerous disease, particularly of the brain. Complete wakefulness, even for many nights, is generally attendant upon nervous and other fevers of a continued type, upon inflammations of the brain, and upon inflammatory affections of an acute character. It also attends the eruptive fevers, rheumatic fevers, the gouty paroxysm, painful and spasmodic maladies, and pestilential distempers. When it is continued for many nights and days, vital power and resistance become exhausted, and delirium, followed by coma, is very apt to supervene. All acute diseases attended by febrile excitement or increased vascular action, especially towards or during the night, are characterised by a more or less complete insomnia; and when the febrile action subsides, then sleep returns, the occurrence of sleep often proving critical of these diseases (see *art.* Crisis).

24. When insomnia is not followed by sound repose after a long continuance, it often passes into a state of half-sleeping and half-waking, in which the ideas of the patient are rapid, unconnected, and otherwise disordered, and generally expressed aloud, or in a low key. He dreams aloud in this half-conscious condition; or becomes more obviously delirious. The slighter forms of this delirium have usually been called wanderings of the mind; and at first they appear only occasionally, or during the night merely; but when they are not soon followed by composed sleep, are apt to be more continued, more fully developed, and to pass ultimately into sopor or coma.

25. If wakefulness is unattended by any very manifest disorder, or even by slight disorder, or such as appears insufficient to account for it, some serious disease of the brain should be viewed as impending, although a considerable time may elapse before the advent of it. In these cases, the symptoms more especially connected with the nervous systems should be carefully investigated, in connection with the occupation, habits, modes of living, arrangements for sleeping, ventilation, &c. The temperature of the head, action of the carotid arteries, the functions of sense, and those of digestion, assimilation and excretion, ought to be carefully examined, and a treatment, based on the report thereby obtained, should be adopted. A dignitary of the church consulted me for prolonged insomnia. He evinced no other disorder. Palsy, or apoplexy, or coma was dreaded, and the treatment was directed accordingly. He was soon very much better, and continued so for two or three years, during which time I did not see him; but at the termination of it he was seized with apoplexy, at a great distance from London, and died in a few hours. An eminent physician and author was afflicted with insomnia, he afterwards became insane. A patient to whom I was called had long been subject to wakefulness, and was afterwards attacked with phrenitis.

26. Pervigilium is not infrequent *in nervous females, after their confinements*, especially when they breathe a close or impure air, or when they have experienced hæmorrhagic or exhausting discharges. It may pass gradually, or even suddenly, into delirium or mania, if not arrested by an appropriate method of cure. I have been called to several cases of this kind, where the disorder was aggravated by a treatment diametrically opposite to what ought to have been adopted, and which, when adopted, speedily cured the patient. This is a most important affection in the puerperal state, and should, even when attended by no other manifest disorder, receive constant attention, and suggest the most decided and appropriate means of cure, — appropriate, however, to the various circumstances which occasion it, to the several associations in which it is presented to us, and to the maladies of which it is either the precursor or the attendant.

27. Insomnia is sometimes met with in *young and even in older children*: in them it should be viewed either as the precursor of serious disease, or as caused by some latent or undeveloped morbid condition. It not infrequently precedes or attends disease of the membranes or substance of the brain, especially tubercular deposits in the former, or softening of the latter, before serous effusions take place to any considerable amount; or it accompanies the earlier and more latent stages of these lesions.

28. iii. *The treatment of insomnia* should be altogether based upon those *indications of cure* which the disease of which insomnia is symptomatic, or of which it is the precursor, should rationally suggest. It is owing chiefly to a neglect of this principle, that means, directed more particularly to this symptom, either fail of producing their intended effects, or even often greatly aggravate this particular disorder. In all cases of insomnia, attention should be directed to the age, temperament, habit of body, modes of life, and diathesis or morbid tendencies of the patient, before measures should be prescribed for the disorder; and these measures ought to be especially devised against the disease on which the wakefulness depends. A principal indication is to remove the several causes, remote, external, physical, and pathological, which occasion it, more particularly

to correct a close or contaminated air; to reduce the temperature of the apartment, when it is high, and the quantity or warmth of the bed-clothes; to remove all the excitants of the senses; to abstract the mind from all exciting, harassing, or engaging thoughts, and to direct it to such as are uninteresting or unexciting — to one simple unimportant topic; and to remove or counteract the morbid conditions, of which this is a symptom or prominent consequence. In both young and aged subjects, but especially in the dyspeptic and gouty, the accumulations of disordered secretions and excretions, — of fæcal or contaminating matters, — of flatus, of acid or saburral materials; — or a loaded state of the stomach or bowels, are apt to take place, and require free evacuation and correction by laxatives, conjoined with antacids and absorbents. The existence of a plethoric state of the vascular system, or of engorgement of the liver and portal system, should suggest a repeated recourse to purgatives, deobstruents, and alkaline preparations.

29. When there is actual fulness of the cerebral vessels, or cerebral congestion, then local vascular depletions, purgatives, derivatives, the shower-bath, warm stimulating pediluvia, &c., should be prescribed; and, if the insomnia appears to be caused by increased vascular action, or by febrile disturbance towards night, or by augmented determination of blood to the brain, antimonial preparations, or other diaphoretics, conjoined with alkalies, &c., will generally procure sleep, whilst narcotics, exhibited in such cases, would only aggravate the disorder, induce headache, and increase disorder of the digestive functions.

30. Anodynes and narcotics should not be exhibited in cases of either incomplete or prolonged wakefulness, until general plethora or local congestions be removed by the means now suggested, — until morbid secretions, excretions, and fæcal accumulations have been completely evacuated. But they are important means after these ends have been attained, and when this disorder occurs in nervous, hysterical, or irritable temperaments; when it follows copious losses of blood, or exhausting discharges, and when it is thus met with in the puerperal state. In these circumstances, the choice of the agent should depend upon the peculiarities of the case, upon the existence or non-existence of anæmia, and upon the evidence as to the purity or richness of the blood, and as to the actions of the several emunctories. When there is anæmia, or great debility or nervous susceptibility, the preparations of opium, or of hop, or of henbane, or of poppy, with those of iron, or the vegetable bitters and the alkaline sub-carbonates, will generally be of service; but all narcotics in such cases should be given two or three hours before the desired period of their operation, more particularly opiates; and in order to secure their effects, and to prevent headache, sickness, or other disorder in the morning, they should be combined with aromatics and alkalies. In some cases, it may be preferable to administer the narcotic in a suitable enema or suppository; or the odour of it may be inhaled during respiration, by lying with the head on a pillow containing a narcotic substance, as hops, &c.

31. When sleep is disturbed by cramps, nightmare, frightful dreams, &c., the bed should be elevated towards the head, and acidity of the prima via and costiveness ought to be prevented by magnesia, either alone or with sulphur, or with an antimonial preparation; and food should not be taken for several hours before retiring to rest. Persons who are subject to partial wakefulness, or to troublesome dreams, or to sleep-walking, should be submitted to the curative means now advised, adapting these, however, to the peculiarities of each case. Due exercise in the open air, attention to the digestive functions, and a common-sense regulation of the moral manifestations and physical powers, will generally aid the effects of appropriate medical treatment. In all cases, the use of substances or beverages which are liable to disturb the digestive functions, to occasion heartburn or flatulence, or to excite the nervous system, more especially during the advanced hours of the afternoon or evening, the reading of exciting writings late in the evening, and reading in bed, more particularly, should be avoided; and, if wakefulness or disturbed sleep occur in persons who are addicted to these practices, it should, in great measure at least, be attributed to them, and the relinquishment of them ought to be insisted on.

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SMALL-POX. — Synon.—*Euphlogia*, Rhazes; —*Variola*, Sydenham, Boerhaave, Sauvages, &c.; — *Pestis variolosa*; — *Febris variolosa*, Hoffmann, Vogel, &c.; — *Synochus Variola*, Young; — *Synochus variolosus*, Crichton; — *Emphyesis Variola*, Good; —*Petite Vérole*, Fr.; — *Pocken, Blattern, Kinderblattern, Kindspocken*, Germ.; — *Vajuolo*, Ital.; — *Viruela*, Span.; — *The Pox*, Scot.; — *Small-pox*, Engl.

Classif.: — 1st. Class, Febrile Diseases; 3d. *Order*, Eruptive Fevers (*Cullen*). — 3d. Class, Diseases of the Sanguineous Function; 3d. *Order*, Eruptive Fevers (*Good*). ∸ III. Class. III. Order (*Author, in Preface*).

1. Definit. — *Small-pox is the product, and is productive, of a morbid poison or miasm, which, after a period, developes fever, followed by an eruption on the surface of the body, passing through the stages of pimple, vesicle, pustule, and scab, with other concomitant or succeeding affections; the disease running a determinate course, leaving marks in the seats of eruption, and removing from the constitution the susceptibility of another attack*

2. I. Historical Sketch. — The term *variola* is probably of monkish origin, it being the diminutive of *varus*, a pimple. The term *pock* is of Saxon origin, and signifies a bag or pouch. The epithets *petite* in France, and *small* in England, were added soon after the appearance of syphilis, or the grand or great pox, in Europe, in 1498. In Scotland the word pox is still used without the prefix.

3. Dr. Hahn endeavoured to prove, early in the last century, that the Greeks and Romans were acquainted with small-pox; and, much more recently, Dr. Willan and Dr. Baron have followed in the same track. Rhazes, who was the first accurately to describe this malady, was also the first to refer to the writings of Galen, in proof of its having been known to the Greeks; but, as Dr. Greenhill has shown in his able notes to his admirable translation of Rhazes, the ἴονθος of Galen was not small-pox, but the *acne* of modern authors. Mr. Moore has striven to show that small-pox was known in China and Hindostan, even before the time of Hippocrates. Dr. Gregory remarks, that he is incredulous of this having been the fact, and that he "is borne out in this scepticism by the opinions of Dr. Friend, Dr. Mead, and many other physicians of great learning, and equally indefatigable in research." It is not, however, improbable, that the disease may have appeared or prevailed in China and other adjoining countries very long before it was known in Arabia or Syria, and that it may have taken even a much longer period to have extended from the former to the latter countries than it took to reach the western parts of Europe.

4. That small-pox was not known to either Greek or Arabian writers early in the 6th century, is manifest from the circumstance of no mention having been made of it in the work of Alexander Trallianus, in which all the diseases then known are briefly described. Dr. Gregory, in his very excellent work on "Eruptive Fevers," remarks, that "the first notice of a disease which looks like small-pox, is to be found in a chapter of Procopius, 'De Bello Persico' (lib. ii. c. 22.), where he describes a dreadful pestilence which began at Pelusium in Egypt, about the year 544." But I cannot agree with this view; for Procopius states that malady to have been attended by buboes and carbuncles, which, with the other particulars mentioned by him, point rather to the plague than to small-pox. Dr. Gregory, however, adds, that whether this "disease was small-pox or not may be doubted; but certainly within a short time afterwards very unequivocal traces of small-pox are to be met with in the countries bordering on the Red Sea, for we read of caliphs and caliph's daughters being pitted." (*Op. Cit.*, p. 35.)

5. It cannot be doubted that small-pox had prevailed and been well known in Arabian and adjoining countries, and even in the western parts of Europe, some centuries before Rhazes described it at the commencement of the 10th century; and probably it was even much earlier known in China, or in some eastern countries, than in these. Mr. Bruce, the celebrated traveller, believed that the first epidemic of small-pox of which any notice can be found, occurred in 522. Mead says that, according to an Arabian manuscript, in the library of Leyden, this malady appeared for the first time in 572, the year of the birth of Mahomet, in Arabia, where it was introduced by an Abyssinian army. Marius, bishop of Avenches, remarks in the second volume of his "*Historia Francorum Scriptorum*," &c., that it existed in Europe two years before this date, and that it ravaged France and Italy. Marius, who sat in the second council of Maçon, held in 585, states positively, in his chronicle, that in 570, "*morbus validus cum profluvio ventris et variolis, Italiam Galliamque valde afflixit;*" that it ceased for some years, and reappeared in 580 in the same form as in 570. He adds, that Dagobert and Clodobert, sons of king Chilperic and Fredegonda, died of this malady; that the wife of Gontran, king of Burgundy, was also attacked in 580, and that, feeling her dissolution near, she accused her two physicians, Nicolas and Donat, of having poisoned her, and requested their execution, which was carried into effect over her tomb.

6. M. Monfalcon states, that Ahron, a physician of Alexandria, at the commencement of the 7th century, first mentioned the symptoms, the different varieties, and the treatment of small-pox; and that, in 640, during the reign of the caliph Omar, when the irruption of the Arabs or Saracens into Egypt took place, the disease appeared in so destructive a manner, as to lead many contemporary writers to suppose that it was a new pestilence. It appears to have extended during the 7th century to all the countries whither the Saracenic conquerors carried their arms.

7. Although Rhazes was the first to write expressly and fully on small-pox, he does not pretend to have been the first who had noticed it, for he gives extracts from the works of Ahron, the elder Mesue, and the elder Serapion, in which mention is made of it. This malady was afterwards noticed by Avicenna, Hali-Abbas, and other Arabian authors. It appears to have reached England towards the close of the 9th century, or even earlier. After or during the Crusades, the spread of the malady appeared more extended. It then prevailed in most of the temperate countries of Europe. Bernard Gordon, professor of medicine at Montpellier, in 1285, notices the frequency and fatality of the disease in France at that time; but it does not appear to have been so early known in Norway, Lapland, and other very northern countries; the coldness and dryness of the air probably retarding its progress to them. Dr. Gregory states that the word Variola is to be found in several Latin manuscripts in the British Museum of dates decidedly prior to 900. It should not be overlooked that the contagious nature of small-pox was admitted by all the Arabian and other early writers.

8. From Europe, small-pox was carried across the Atlantic to Mexico, which it devastated in 1527, and spread from thence, with fearful virulence, throughout the American continent. The ravages of small-pox were especially great within the tropics, and still are most remarkably so in the dark-skinned races, as sufficiently demonstrated to my own observation. From the earliest notices of the malady, until the appearance of the writings of Sydenham, there is little to mention in the history of its progress, prevalences, or treatment, further than that it was the most generally diffused, the most frequently epidemic, the most fatal, and the worst treated, of all known pesti-

lences. The heating or sweating regimen had gradually reached its acme when Sydenham appeared. He not only accurately described this disease, but distinguished it from measles, and reformed the treatment of it. Boerhaave and Van Swieten adopted and carried out the views of Sydenham, and demonstrated the extension of the malady by means of a specific miasm or virus alone.

9. The *inoculation*, or artificial production, of the disease was then only brought into notice in Europe, although it had been practised in various countries for ages previously. We have no information as to the period when this resource was first adopted, or as to the circumstances which suggested it. It is by no means improbable, that the well-known contagious nature of small-pox, the greater severity of the disease in childhood and infancy than in adult age, the admitted liability of all to be infected, the immunity from a second attack, and the desire generally felt of having what was inevitable undergone as early in life as possible, may have suggested to those exercising the healing art the experiment of artificially communicating the disease, when prevailing in a mild form, to children and those exposed to its infection, in order to secure an immunity from it in after-life; and it is equally probable that those considerations influenced many in more countries than one, and at different eras. The obvious advantages which resulted must have led to the diffusion and the continuance of the practice. Voltaire, writing as early as 1727 in favour of inoculation, remarks, that the females of Circassia and Georgia were, from times immemorial, in the habit of communicating the small-pox to their children at as early an age as six months, by making an incision in the arm, and by inserting in this incision the contents of a pustule taken from another child. M. Monfalcon states, that inoculation was practised from remote antiquity in Africa, especially on the coasts of Barbary, in China, Hindostan, Egypt, Armenia, Tartary, in Greece, and even in Wales and some parts of the west of England, and in Auvergne and Perigord in France. He does not, however, give the authorities for this statement. Bartholin, who wrote about the middle of the 17th century, states that inoculation had been long used in some parts of Denmark. Monfalcon remarks, that it was employed for the first time in Constantinople in 1673, and Bruce, the celebrated traveller, says that it had been practised for ages in Nubia. Dr. E. Timoni, Mr. Kennedy, and Dr. Pylarini, in 1714 and 1715, made the profession in England acquainted with it, but no attention was paid to it, until Lady Mary Wortley Montagu had her son inoculated at Constantinople in 1717, and her daughter in 1721 in England. After successful trials upon six condemned criminals in Newgate, the Princess of Wales submitted successfully her own daughters to the new process in 1722. Voltaire, in 1727, was the first writer in France to direct popular opinion in favour of inoculation. His observations on the subject may even now be read with interest. He remarks, that most of the 20,000 who died of small-pox in Paris in 1720, would have been saved if inoculation had been then introduced.

10. The first ten years of the career of inoculation in this country, Dr. Gregory observes, were singularly unfortunate. It fell into bad hands; it was tried on the worst possible subjects, and practised in the most injudicious manner. The consequence was that it soon fell into disrepute. The pulpit, too, sounded the alarm; and conducted as inoculation then was, it was a questionable improvement. A new era in this practice arose in 1746. The Small-pox Hospital was founded for the extension of inoculation among the poor. In 1754, the College of Physicians put forth a strong recommendation of the practice, and Mead and De la Condamine wrote treatises in favour of it. In 1763, the practice was especially adopted by Mr. R. Sutton and his two sons, who inoculated with great skill and success. "In 1775, a dispensary was opened in London for the gratuitous inoculation of the poor at their own houses; but the institution failed, chiefly through the opposition of Mr. Dimsdale, who had succeeded the Suttons, and fully equalled them in popularity and success. The Small-pox Hospital then took up the plan of promiscuous inoculation, which was carried on, to an immense extent, between the years 1790 and 1800. In 1798, Dr. Jenner announced the discovery of vaccination. In May, 1808, the inoculation of out-patients was discontinued at the Small-pox Hospital. In June, 1822, inoculation was discontinued to in-patients. On the 23d July, 1840, the practice of inoculation, the introduction of which has conferred immortality on the name of Lady Mary W. Montagu, which had been sanctioned by the College of Physicians, which had saved the lives of many thousands during the greater part of the preceding century, was declared illegal by the English parliament. All offenders were to be sent to prison; and it was even provided that any attempt to produce small-pox by inoculation, even though unsuccessful, including, of course, the testing of vaccinated subjects, was an offence at law." (*Op. Cit.*, p. 39.)

11. II. Description of Natural Small-pox. — This malady presents several forms, depending chiefly on its grades of severity, these grades arising from the intensity or concentration of the infecting miasm; from the susceptibility, constitution, or habit of body, of the person infected; and from the extent to which vital organs or surfaces are affected by the morbid actions developed by the morbific leaven. The state of the eruption more especially fixes our attention, inasmuch as it disorders the functions of an important organ, as it is a suppurative inflammation of a surface which induces serious sympathies in the œconomy, as it is an indication of the state and character of the vital powers, of the vascular action, and even of the blood itself; and as it most visibly and tangibly manifests the form or variety of the disease, suggesting not merely the diagnosis and prognosis, but also the indications of cure. As respects the *eruption*, therefore, it may be *distinct*, *corymbose*, *semi-confluent*, or *confluent*, according to the number, grouping, or distribution of the pustules; it may also be superficial, cellular, limited to the cutaneous surface, or extended more or less to the mucous membranes, especially at the outlets of canals; it may, moreover, be papular, vesicular, pustular, ichorous, scorbutic, or sanious, or purplish, or even blackish, according to the changes taking place in it. As regards the *type* or *character* of the attendant fever, small-pox r--

be *benignant*, *synochoid*, *petechial*, *malignant* or *putro-adynamic*. It may also be *simple* throughout its course, and it may be more or less *complicated*, or associated with a prominent affection of one or more important internal parts or vital organs, developed during the progress of the malady. As will be rendered more apparent in the sequel, there is in general an intimate dependence of the state and appearance of the eruption upon the type and character of the fever, and of this latter upon the organic functions and the conditions of the blood. Whatever may be the form which the disease may assume, or however varied the associations of the states now enumerated may appear, small-pox presents certain stages which more particularly mark its course. These stagse have been divided into, 1st., that of incubation; 2d., that of invasion; 3d., that of eruption; 4th. that of suppuration; and 5th, that of exsiccation, But some authors have distinguished only three, namely, 1st., incubation; 2d., maturation, and 3d., decline. The stages may be divided into, 1st., the *latent*, *precursory*, or *incubative*; 2d., the *febrile*, or *the primary fever*; 3d., the *period of eruption and development*; 4th, the *maturative* or *suppurative stage*, or the *period of secondary fever, desiccation, and decline*.

12. i. DISTINCT, BENIGN, OR SIMPLE SMALL-POX. — This form of the disease is very frequently met with in healthy constitutions, favoured by a pure air. It was that most frequently produced by inoculation, when this mode of communicating the disease was permitted. Between it, however, and the confluent, no very precise demarcation can be assigned, as the corymbose and the semi-confluent are mere approaches to this more severe form. In the distinct or benign states of small-pox, there is no serious depression of the vital power, or contamination of the fluids or solids, or dangerous affection of internal or vital organs, which more or less prominently mark the confluent and typhoid forms of the malady. The distinct small-pox presents in general the regular procession of the stages just distinguished,

13. *A. The period of latency* or *incubation*, — the *precursory stage*, — in small-pox, or the time which elapses from the inhalation of the infecting miasm, or the morbific leaven, until the appearance of the primary fever has been ascertained with considerable precision on numerous occasions. In cases of inoculation, the duration of the stage is rendered apparent. But in natural small-pox it is very commonly a matter of doubt. Dr. GREGORY, who has directed his attention to this topic, states that a large accumulation of facts enables him to fix this period at about twelve days, and that the extremes may be stated at ten and sixteen days. It has been, however, contended by several writers, that circumstances may occasion much longer or much shorter periods of incubation than are here assigned; and my own observation tends to confirm this opinion. A concentrated effluvium or miasm from the infected; a severe and prevalent epidemic; a very susceptible, weak, or cachectic habit of body; great fear of the disease, or dread of infection; a warm, humid, and close atmosphere; and the respiration of air, loaded with emanations from a number of small-pox cases, may somewhat shorten this period, and hasten the next or eruptive. On the other hand, various circumstances may prolong this stage, and retard the appearance of the next, especially a weak dose of the poison; strong health and insusceptibility of the patient; a dry, cold, and pure state of the air, or residence in a dry and bracing locality. In the former circumstances, the period of incubation may possibly be shortened to seven or eight days, and in the latter it may be prolonged even to twenty or twenty-one days; but of these extreme ranges Dr. GREGORY very strongly doubts, ten and sixteen days being the extremes according to his observation. The inoculated disease furnishes a more determinate duration, which is generally from seven to nine days.

14. The first days of this period are often passed without much, or obvious disorder; but, in other cases, some symptoms are experienced indicating a state of impaired health, especially languor, lassitude, or malaise. When the disease is infected by a miasm floating in the air, or emanating from the sick, the patient sometimes experiences, at the time, an unpleasant and peculiar odour, generally attended by a feeling of sickness, giddiness, and of impending disease. When this feeling is strong, it is often accompanied by a state of alarm or dread, which seems to shorten this stage and to hasten on the next, and even to render the malady more severe.

15. *B. The febrile stage, or that of invasion — the primary fever*,—supervenes upon the preceding period; or from the ninth to the thirteenth day from the time of infection, or from the seventh or eighth day from inoculation, the patient experiences rigors, followed or attended by febrile symptoms, especially acceleration of pulse, heat of skin, pains in the loins and limbs, restlessness, scanty and high-coloured urine, nausea, vomiting, &c., &c. In some cases, the *rigors* and *heats* alternate for some time, or during the first day; but the latter generally soon follow on the former. On the second day the fever is attended by *nausea* and *vomiting*, and great depression, with tenderness at the epigastrium on pressure, and anxiety at the præcordia. The lassitude and torpor are often accompanied, in adults, with somnolency, headache and sweats; and in children, with faintness, sinking, or even with convulsions, or eclampsia. *Pain* throughout the body, more especially in the head, back, loins, and limbs, is always experienced, and the pain at the epigastrium is often so severe as not to admit of the least pressure, or even the weight of the bedclothes. In some cases, the headache is attended by stupor or delirium, especially in adults, and in children, by sopor, or epileptic convulsions; in these, the face is hot and flushed, and the carotid and temporal arteries beat strongly, the *tout-ensemble* of the symptoms indicating great vascular reaction. SYDENHAM remarks that, when children, especially after dentition, are seized with convulsions during the primary fever it is a sign of the speedy appearance of the eruption; so that supposing the convulsions to take place over night, a kindly small-pox may be expected to appear in the morning.

16. In other cases, excessive prostration, with faintness or syncope, extreme anxiety at the præcordia, oppression at the chest, frequent sighing, and even dyspnœa, pallid countenance, coldness of the extremities, and feeble pulse, usher in the febrile stage, and take the place of rigors or chills, or follow immediately upon them. These symptoms are indications of the depressing influence of the

poisonous miasm on the organic functions, and of the inability of the vital energies to react sufficiently, or to develope a state of healthy action. In these cases, a confluent state of the disease, or marked adynamia may be expected, with pulmonary congestion, &c. One or other of the foregoing groups of symptoms generally usher in the eruptive fever; and although neither of them can be considered as evidence of the nature of the incipient malady, still, the previous good health of the patient, the suddenness or severity of the seizure, the prevalence of variola in the vicinity, or prior exposure to infection, even although vaccination or previous small-pox should have been undergone, ought to be viewed as very strong indications of the disease. Dr. Gregory justly remarks, that the fact of prior vaccination should not throw the physician off his guard, for the initiatory fever is just as severe after vaccination as it is in the unvaccinated.

17. C. *The period of eruption and development.* — Forty-eight hours elapse from the rigors to the first appearance of eruption. The period is never less, but it may be protracted by weakness of constitution to seventy-two hours, and the full development of the eruption over the whole surface, may even occupy three days. Generally, however, the eruption appears on the third or fourth day of the fever. During this fever, besides the more prominent symptoms above mentioned, stridor of the teeth in children, with sopor, is very common; and in adults, a peculiar and fœtid odour, with sleeplessness, dryness of the fauces, and turbid state of the urine. The pulse is much increased in frequency, and is either soft, or broad and compressible. The febrile symptoms more or less abate in the morning, and increase towards evening.

18. Minute papulæ, sensibly elevated above the general surface, or plane of the skin, show themselves, at first on the face, forehead, and wrists, especially on the sides of the nose, upper lip and chin; then on the neck and breast, and afterwards, on the limbs and trunk. When the papulæ are numerous, their first appearance is attended by tension and slight pruritus; and, upon moving the fingers over the skin with some firmness, the papulæ are felt to be not merely superficial, but based in the cutis vera. The eruption rarely commences in the lower extremities. Sometimes two or three large papulæ precede the general eruption, and advance to the state of vesicle, before the surface is extensively occupied. The papulæ are "generally not thrown together confusedly and without order, but are arranged in groups of three or five. Crescents and circles may be traced very distinctly, when the eruption is not too copious. This constitutes an important diagnostic between variola and varicella." In most cases, the eruption affords great relief to the general constitutional disturbance. The fever abates, the sickness subsides, and the pains of the head, loins, and limbs moderate, or altogether cease.

19. *The development* of the papulæ commences with the evolution of the eruption and the subsidence of the fever, which precedes and evolves the eruption. But during this period, although the fever abates, more or less remarkably, especially in the benign, or distinct form of the distemper, yet it rarely ceases altogether, or disappears without returning more or less slightly in the evening. When the eruption is abundant, or the temperament of the patient is irritable or sanguineous, the mitigation of the fever is less remarkable; and, if the eruption has been delayed, or is confluent, or if the disease be complicated by some internal congestion or prominent affection, the febrile action may be continued during the development and maturation of the eruption with but little abatement, and generally in a typhoid, adynamic or even putro-adynamic form or type.

20. The number of the pustules vary according to the severity of the case — from three or four to some thousands, appearing first on the face, neck and upper extremities, then on the trunk, and lastly on the lower extremities, and changing from the state of papulæ, or vari, to that of vesicle and of pustule in succession. When the eruption is fully out over the body, and the pustules on the face begin to maturate, or about the eighth day from the commencement of the eruptive fever, the whole face, head, and neck become somewhat swollen, particularly the eyelids, which are often so distended as to close the eyes; and the swollen parts are painful when touched, and even throb. This intumescence lasts about three days, the spaces between the pustules appearing inflamed, or of a deep red, or damask rose colour: the closer this resemblance, the milder, generally, is the subsequent disease. Nearly one fifth of the number of pustules appear on the face; and according to Sydenham, the danger is in proportion to the number of pustules on the face, those on the other parts of the body hardly influencing the event. This, however, is not altogether the case, for the danger chiefly arises from the *tertiary* effects of the poison, or those produced upon vital or internal parts; the *secondary* effects being the cutaneous eruption.

21. *D. The suppurative or maturative stage,— the period of secondary fever and desiccation.*— With the intumescence of the face, the fever, which had remitted, returns, and the secondary fever commences. In cases of ordinary severity, the return of the fever is marked by a considerable increase of heat of surface, by a frequent pulse, and by slight delirium, from which the patient is easily roused. In favourable cases, the swelling of the face, the redness of the intervening spaces, and the secondary fever, having continued from the eighth to the eleventh day, subside, and the pustules, now fully ripe, burst and discharge a thin yellow matter, which concretes into crusts that fall off on the fourteenth or fifteenth day from the commencement of rigors, and the disease terminates, leaving the surface underneath the crusts depressed and of a pale lake colour. If the disease be of greater severity, hæmaturia, hæmoptysis, oppression in the chest, or a hard dry cough, may be complained of, with severe headache or pains in the loins or limbs, and more marked delirium, or even sopor; these more severe symptoms, however, generally subsiding on the eleventh or twelfth day.

22. When the symptoms assume an unfavourable aspect or threaten a fatal issue, then the face, which ought to have been intumescent on the eighth day, remains without any fulness or swelling; and the spaces between the pustules, instead of being red or inflamed, as seen in the favourable cases, are pale and white. Sydenham says

the pustules look red and continue elevated even after death; and the sweat, which was free up to this day, suddenly ceases. At this critical period, the secondary fever, instead of presenting more or less of a sthenic character, may assume either a typhoid or an asthenic or a sinking form. When the secondary fever presents a typhoid type, the tongue becomes brown and dry, the pulse very frequent, and delirium soon appears, and often quickly passes into sopor or coma. In the rapidly sinking form, the patient may appear as suddenly overwhelmed by the depressing influence of the morbid poison, the pulse being hardly increased in frequency, the heat of the body natural, and the intellect unimpaired. Dr. R. Williams remarks, that the first case he saw of this kind, he could not help assuring the patient "that his symptoms were favourable; but he shook his head, and, perhaps from an inward feeling that his fate was sealed, affirmed that to survive were impossible, and he died a few hours afterwards." (*On Morbid Poisons*, p. 228.) Such cases are, however, rare in the discrete small-pox, but they are much more frequent in the confluent (see §§ 33. *et seq.*), and result from the influence of the poisoned and contaminated blood on the organic nervous system and heart. These cases very closely resemble, in all respects excepting the eruption, the character and termination of the putro-adynamic form of *fever* (which see §§ 472. *et seq.*).

23. In the more severe cases of the discrete or distinct small-pox, the morbid poison acts not only on the skin, but also on the mucous membrane of the eyes, throat, and mouth, occasioning an eruption, often somewhat pustular, in these parts. This additional affection does not appear to aggravate the fever, at least not materially, but it occasions more or less inconvenience. The eruption in the mouth and throat causes hoarseness, soreness of throat, and difficulty of swallowing. When the eruption extends to the conjunctiva or cornea it is often not attended by much pain; but when the swelling of the eyelids has subsided, the extent of mischief which sometimes takes place, especially when the cornea is implicated, is then discovered. The mucous surfaces are, however, not so much or so generally affected in the discrete as in the confluent form of the distemper (§§ 39. *et seq.*).

24. At this period a peculiar faint and sickly odour, particularly when the eruption is copious, emanates from the patient. Sometimes, especially in females and persons of a delicate and scrofulous habit of body, the secondary fever is accompanied with a very tender state of the general surface; but it is a very favourable sign. Recovery may be retarded by weakness of habit, by cold, and by the presence or development of the scrofulous taint. An ecthymatous eruption may also occupy the surface, or the skin may be left dry and scaly, or the scabs may be adherent. These phenomena are chiefly owing to the form of secondary fever, in connection with the habit of body, &c.

25. *E. Of the progress and appearance of the discrete eruption.* — The affection of the skin being generally present, whilst that of the mucous membranes is often wanting, especially in milder cases, the cutaneous eruption requires especial attention. The *eruption* runs a course of eleven or twelve days, in discrete small-pox, from the very first appearance of it until its termination; and, in its progress, is at first tubercular or papular, then vesicular, afterwards pustular, and lastly, it scabs and falls off. The first, or papular, lasts about two days; the second, or vesicular, occupies four days; the third, or pustular, or suppurative, lasts three days; and the desiccative lasts three days more. The form and progress of the eruption is different in the confluent, in the verrucose small-pox, and in variola after vaccination. The eruption at first consists of a number of minute pimples or papulæ, which feel like minute tubercles in the true skin, when the fingers glide firmly over the surface, and are about the size of a pin's head. They are more or less numerous, but distinct from one another, and hardly salient. On the third, or close of the second day, a minute vesicle forms on the apex of each pimple or papula, which, as it fills, is bound down or depressed in its centre, or umbilicated, and contains a clear whey-coloured fluid. On the approach of suppuration or maturation, the cuticle covering the vesicle loses its transparency, and becomes white and opaque. About the fourth or fifth day of the eruption, a red areola appears around the base of each vesicle, and, shortly afterwards, the central *bride*, causing the umbilication of the vesicle, ruptures, and the vesicle becomes pustular, enlarges, and fills, and assumes a somewhat conical or acuminated form. From the fifth to the eighth day of the eruption, the pustule maturates, when the surface becomes rough and yellow, and the cuticle breaking, allows a portion of the contents to ooze out. In the interval from the eighth till the eleventh day, the pustule secretes the peculiar viscid matter which concretes and forms the scab. This scab desiccates, and is detached between the eleventh and fourteenth day, leaving the cutis, which it covered, of a reddish brown, which lasts many weeks; but if the pustule has so penetrated, as to cause ulceration of the rete mucosum, it leaves a permanent depression or pit. The cicatrix which is formed after these burrowing pustules is usually white.

26. *F. The internal structure of the variolous pimple and pustule* has attracted the attention, first, of Cotugno in Italy, and afterwards of John Hunter, Adams, Bousquet, Gendrin, Judd, Petzholdt, and others. Dr. Gregory has given the following account of the organisation of the variolous pustule: — "Inflammation begins at the spot called the phlyctidium. Its seat is in the cutis vera. From the central point, or stigma, the inflammatory action proceeds by radiation to the surface, penetrating to a greater or less depth in different cases. Beneath the epidermis, and constituting the greater part of the phlyctidium, is formed a substance or disc, of the consistence of pulp or thick mucus. This is not considered as any part of the skin altered by disease, but as a product of a specific action of the vessels. John Hunter and Adams called it the variolous slough. At the height of suppuration this substance is swollen, and moist like a sponge. The floor of each phlyctidium presents the papillated structure of the skin, elevated and marked with fissures. The vesicle is divided, like the substance of an orange or poppy-head, into numerous cells — twelve or more. It is multilocular. A filament of cellular tissue binds down the central portion of cuticle to the lower surface of the phlyctidium, and gives to the vesicle, in its early stages, that umbilicated form — that de-

pression of its centre which, though not peculiar to the variolous eruption, is so striking a diagnostic mark between it and genuine varicella. The fluids, lymph and pus, which at different periods distend its cells, destroy at length the filamentous attachment of the stigma to the cuticle, and that which was at first a depressed or umbilicated vesicle becomes at last an acuminated pustule. It bursts, discharging a well-formed purulent matter, of a yellowish colour and creamy consistence." [*]

27. The inflammation of the phlyctidium is attended by a specific or erythematous inflammation, called the areola, extending to some distance beyond the margin of the vesicle. The exact tint of this areola should always be carefully noted as indicative of important local and constitutional states. On the subsidence of this inflammatory areola, the ripened pustules, having burst and discharged their contents, are succeeded by scabs, which dry up and fall off, in a healthy constitution, in four or five days. In very mild cases, when the process of pustulation is not fully gone through, many of the vesicles shrivel, and form only imperfect, scaly crusts. On the lower extremities, this premature desiccation of the vesicles is often very general.

28. In severe cases, the inflammation of the corion does not cease with the completion of the pustulating process. Portions of the cutis vera are then actually destroyed and slough away, the skin presenting the appearance of pits or fossæ, with a clarety hue, when cicatrization is at length completed. The dark tint wears off in the course of three or four months, but the depressions are permanent. From the great vascularity of the face, and from the exposure of it to light and air during the progress of the eruption there is always a more severe effect and disfigurement produced by the disease in this situation, than in any other part of the surface of the body.

29. ii. Modifications of Discrete or Benign Small-pox. — *A. Verrucose Small-pox — Variola verrucosa.— V. cornea. — Horn-pock, &c.* This mild, mitigated, or modified form was well described by Van Swieten. Its symptoms are similar to those of the preceding form, but are much milder. The primary fever is often little more than a febricula, and the pustules seldom exceed one or two hundred. These, indeed, seldom reach a pustular state, but, having passed through that of tubercle or papula into that of vesicle, on the sixth day, or even sooner, desiccate, shrivel up, and crust. This form is so mild, that the secondary fever is not manifested, and consequently is wanting; convalescence commencing on the eighth day of the eruption.

30. *B. Variola discreta siliquosa.*—When there are empty vesicles between the pustular pimples, or when the pus of the pustular pimples has been absorbed, so that they are left empty, the disease has been named *discrete siliquose small-pox.* When the eruption continues *vesicular*, instead of being pustular, the disease has been called *discrete crystalline small-pox.* When vesicular pimples appear in the interstices between the pustules, this modification has been named *discrete vesicular small-pox.* In these varieties the symptoms are generally mild, and the eruptive fever generally slight or moderate, and the secondary fever is either wanting or mild; the duration of the disease being rarely prolonged, but often somewhat shortened.

31. *C. Small-pox without the eruption.—Variola sine Eruptione.*—Variola presents, in the more severe cases, the fever, the cutaneous eruption, the affection of the mucous membranes, and the internal complications, hereafter to be described. In the more mild or benign cases, it consists only of the fever and the eruption; but, in both classes of cases, there is a *primary* and *secondary* fever. In small-pox the fever is remarkable, and distinguished from all other fevers by its remission at the end of four days, or when the eruption has come out, and by its return after a remission of four days, or about the end of the eighth day in the discrete, and about the eleventh day in the confluent small-pox. But cases sometimes occur, especially where the pustules are few, or their maturation is rapid or abridged, in which the secondary fever is either very slight or altogether wanting; and other cases are met with, much more rarely, where neither the eruption, nor the secondary fever, is detected; and yet there can be no doubt of infection having taken place, and of the system being protected from another attack. In those, however, the primary fever has

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[*] The following descriptions further illustrate this topic: — Bousquet says that the pustule has its seat in the true skin, and that the epidermis is not thickened. On removing, however, the epidermis, which is easily detached, we discover a white, opaque, smooth surface, which is a layer of lymph deposited from its adherent surface, and on removing this "disc," the interior of the pustule is seen divided by many concentric radii into a number of divisions or cells, each filled with fluid, but not communicating. This interior arrangement, Bousquet compares to a cut orange, or pomegranate, while Gendrin says, it resembles that of a spice box. The depression at the centre on the *umbilication* is occasioned by a portion of cellular tissue which binds down the cuticle, and is slow to undergo the process of ramollissement by which it ultimately ruptures. The description of the pustule by Mr. Judd, who appears to have examined the formation of the small-pox pustule with great care, is, in some respects, different. For he states, "that in the small-pox pustule, circles of vessels enlarge and project from the cutis vera, and they secrete a thin serum, which gradually raises a ring of the cuticula externa from the rete mucosum, and distending it, forms a vesicle, without, except in some violent confluent cases, breaking up the attachment in the centre between the cutis rete and the cuticle. Hence the vesicle is bound down at that spot, and hence it has a depressed summit. The degree of inflammation suddenly increases, and a thick coagulable lymph is then thrown out that at once consolidates, and forms a thin flat plate like a cymbal, but with a small hole left through its centre, from the coagulation taking place around the before-mentioned thread-like attachment of the cuticle. Now, about the time when the fever and inflammation are again increased, called the secondary fever, and pus being secreted, it elevates the lately described cymbal, or plate, and causes it to divide the pustule horizontally, into an upper and lower cell, and the progressive distension at times breaks up the remaining attachment between the cuticle and cutis. The pustules become opaque; for the pus passes through the hole in the plate, or septum, and blends with the lymph or serum above. The lower part of the pustule is completed by an extremely thickened state of the rete mucosum, which forms a raised lip or cup around; and, in most instances, the pustule may be stripped off with the cuticle and rete, still leaving the cutis entire. But the cutis vera has frequently a slight depression left from ulceration at the base of the cup, and occasionally a papule of the cutis projects into its centre, to which the band of attachment from the cuticle still adheres.

"After the incrustation has separated, and the eruption is gone, a stain with a depression, is commonly left in the centre of the rete mucosum, occasioned by a zone of red vessels remaining long distended, both in the Ethiopean and in the European. In the former it is black and permanent, except when the cutis vera has been penetrated; whilst in the latter the marks are red and transitory, unless, indeed, when ulceration has penetrated the cutis, in which case, in them, also, the pits are white and permanent in the European."

taken place, but without inducing the usual eruption. Sydenham, Lentin, Pelargus, Dubousis, Du Bourg, Frank, and others have observed, during the epidemic prevalence of small-pox, that some few persons who have not previously had the disease, nor been vaccinated, have been seized with all the symptoms of the primary variolous fever, and which having subsided without any eruption having appeared, they have afterwards been found unsusceptible of the disease.

32. Sydenham, De Violante, Crosse, and some other writers above referred to, have remarked that cases have occurred, during the periods when small-pox was raging, which have been attended by petechiæ, bloody-urine, or by purple spots and low fever, and have terminated fatally. These cases were viewed by them as small-pox without the eruption the severity of the internal complication, or the state of the habit of body and of constitutional powers preventing the due and regular evolution of the disease on the surface. It is by no means unreasonable to suppose, that analogous phenomena to those which I have described in respect of *scarlet fever* (see that disease § 26. *et seq.*), may also occur during the prevalence of epidemic small-pox; and that, owing to a predominant affection of the kidneys, or to depressed vital power, the eruption is either not developed on the surface, or very imperfectly, or in such manner as remarked by these and other writers. In cases where the kidneys are thus severely and early implicated, especially so as to arrest their excreting functions, not only are the usual phenomena and progress of the distemper interrupted, but a fatal issue soon takes place.

33. iii. Symptoms of Confluent Small-pox. —This state of the distemper commences generally with symptoms similar to those of the distinct variola, but more severe. The primary fever is usually attended by more sickness and vomiting; by severe pain in the loins, head, and limbs; by greater heat of surface; by more considerable and continued delirium; and, in children, especially in the evening, or just before the eruption, by eclampsia or convulsions. The fever is not only more intense than in the discrete variola, but it is also of shorter duration; the eruption appearing somewhat earlier, or generally on the third day, sometimes at the end of forty-eight hours from the rigors, but rarely later than the third day. The sooner the eruption appears, the more confluent, generally, does it become. Sometimes it is preceded by extensive erythematous inflammation, and the papulæ come out irregularly, or in small clusters, or resemble the measles, and are more prominent than in the distinct variola.

34. The eruption is followed by a less complete remission of the primary fever than in the discrete small-pox, the pulse continuing frequent and soft, the tongue white, and the skin more or less hot, especially in the evening or night, when, also, delirium often recurs. Salivation, which seldom is seen in the distinct, excepting in the more severe cases of that form, very generally occurs in the third stage of the confluent distemper — during the period of development, beginning either with the eruption, or a day or two afterwards. The salivary discharge is at first thin and abundant, resembling that produced by mercury; but it becomes thick and viscid about the eighth day of the eruption; and, in very severe cases, it either ceases for a day or two and then returns, or it disappears altogether. Adults are more liable to salivation than children; but diarrhœa more frequently occurs in the latter, and often becomes profuse, or continues during the disease. The eruption is more or less modified in the confluent distemper; for the pustules, especially those on the face, do not rise, and are more irregular and flatter in their forms than in the discrete form. Owing to their greater number and contiguity, they run into each other and become confluent; sometimes forming irregular blisters or bullæ, varying from the diameter of a fourpence or sixpence to that of a half-crown.

35. These symptoms may not vary materially until the eighth day of the eruption, or eleventh of the fever, when the stage of secondary fever commences, and greatly increases the severity of symptoms and danger of the malady. Previous to this period, the confluent malady seldom endangers life unless hæmaturia, or suppression of urine, or hæmoptoë, or congestive pneumonia, or general bronchitis, &c., supervene, or the character of the pustules, or other signs, indicates a very contaminated state of the circulation. On and after the eleventh day, especially on that day; and on the fourteenth, the seventeenth, or the twenty-first day, according to Sydenham and R. Williams, the patient is often brought to such an extremity, that it is equally uncertain whether he may live or die. He is first endangered on the eleventh day by a high fever, attended by great restlessness or delirium, or by other symptoms, which usually prove fatal unless controlled or prevented by treatment. If he outlive this day, the fourteenth and seventeenth are to be dreaded, for distressing restlessness, with more or less of the unfavourable symptoms about to be noticed, are liable to come on, or to become aggravated, between the eleventh and fourteenth days, and to place him in the most imminent jeopardy.

36. The most dangerous symptoms in the advanced stage of the distemper, or appearing with or during the secondary fever, are, the absence of the usual redness in the intermediate spaces; the non-intumescence of the face; the distribution of petechiæ in the interstices, or a black spot, hardly so large as a pin's head, in the centre of each pustule, or the partial filling of the pustules with a dark ichorous matter, or a disposition to gangrene in the larger vesicles; suppression of the salivation; cough, with hæmoptoë; suppression of urine, or hæmaturia; the signs of congestive pneumonia or bronchitis on percussion and auscultation, more especially if attended by lividity of the lips, face, or extremities, indicating the affection of both lungs, which is generally the case; a brown or dry tongue; great restlessness, or a continued delirium, coma, or sopor; unconscious evacuations; exudations of a dark or ichorous blood from the mucous canals, &c. From certain of these, particularly those first mentioned, recovery may take place when the treatment is judicious and energetic, but the convalescence is long, and its progress is often delayed by ulcerations of the cornea, or general asthenic ophthalmia causing blindness; by purulent depositions in the joints, or ulcerations or erosions of the cartilages, producing lameness; by otitis terminating in deafness; by abscesses in various

quarters, and by suppuration of the subcutaneous cellular tissue, causing cicatrices and alterations of the features. (*See the Complications, &c.*, § 42.)

37. The disease may assume a *semi-confluent form*, or one intermediate between the discrete and the confluent. This form is generally *superficial*, although not always or necessarily so, and much less frequently implicates the sub-cutaneous cellular tissue than the confluent. When thus superficial, whether semi-confluent or confluent, the eruption passes through its regular stages, but the inflammation does not extend deeper than the cutis vera. This superficial confluent form appears in the unvaccinated and sometimes in the vaccinated; and the pustules over the whole body maturate equally and regularly, pursuing their usual course, and occupying the full time to their termination or desiccation. "This form of the disease was well known before the days of Jenner, and is not to be confounded with the confluent small-pox, as modified by vaccination." (Gregory.) It takes either the same time to maturate as the distinct, namely, seven days, or an intermediate period between the discrete and the confluent, videlicet, about eight days, the confluent generally requiring nine or even ten.

38. iv. Variola after Vaccination. — The symptoms of this form of the disease may vary with the time which has elapsed from vaccination, but in the majority of cases they are the same as those characterising the variola verrucosa, or the horn-pock (§ 29.), or that very mild or mitigated form which maturates in five or six days, or in a shorter period. I have seen, on several occasions, and even described, as early as 1823 (*see Lond. Med. Repos.*, vol. xxi.), small-pox as it affected the members of the same family at different periods after vaccination; and in the younger persons, or those who had been vaccinated only ten or eleven years, the primary fever produced an eruption which was merely papular, or hardly vesicular, whilst in the older, or in those who had been vaccinated a longer period, the primary fever was more severe, and the eruption either vesicular and verrucose, or pustular in a distinct or even confluent form; the severity and fully-developed state of the disease being generally in proportion to the length of time which had elapsed from vaccination. In the former class of cases, the disease is thus more or less modified, and the secondary fever, either slight or absent; but in the latter, or pustular, the modification is either slight or hardly apparent, the secondary fever being more or less severe. I have, moreover, seen cases, after undoubted vaccination, having been effected from thirty to forty years previously, that presented the most malignant states of the confluent disease, the pustules maturating imperfectly or slowly, or being filled with a black ichorous matter, the distemper presenting the characters described when treating of *putro-adynamic fever*. (*See art.* Fever, §§ 472. *et seq.*)

39. III. The Complications of Small-pox. — *A.* In a large proportion of confluent, and in some semi-confluent cases, the *mucous surfaces* are more or less implicated in the progress of the malady. The parts to which the air has ready access are most frequently affected, as the nose, mouth, trachea, &c.; but other parts covered by mucous membranes are also attacked, as the œsophagus, stomach, intestines, &c.; this *mucous complication* has been well described by Dr. Gregory. The eruption appearing on these surfaces is sometimes distinct, but more frequently confluent. Numerous white points appear on the tongue, palate, velum pendulum, and pharynx. Hoarseness or alteration of voice indicates that the same or similar changes extend to the mucous surface of the larynx and trachea; and the pain in swallowing shows that the pharynx and œsophagus are also affected, especially in severe cases. In these especially, a cough, which is at first dry, tearing, or clangous, is present with more or less dyspnœa and oppression in the chest. As the malady progresses, the cough becomes more loose, but sometimes also more suffocative, and about the seventh or eighth day expectoration is more or less abundant, frothy, and viscid, containing some whitish specks. This affection of the respiratory surfaces often evidently increases, and extends over a larger surface; and constitutes a peculiar or specific form of acute *laryngo-tracheal bronchitis*, which may exist either singly or separately, or be associated with a *congestive pneumonia*, or superinduce this latter. When once this complication is present, and more especially when it is thus severely extended, most dangerous results are then generally observed. It is apt to occur in the most severe cases, or where the constitutional powers are weak, and the febrile symptoms present more or less adynamia. In these circumstances, this complication is the more liable to extend downwards; and, from the trachea, it is prone to advance to the bronchi of both lungs; the *bronchitis*, or the *pneumonia*, or the *broncho-pneumonia*, thus superinduced, being not only asthenic or congestive, but generally double, or implicating both sides; hence the severity, the rapidity, and the fatality of the results.

40. Even when the complication is limited to the mouth, throat, and larynx, or proceeds no further than the trachea, the œdema or swelling of the sub-mucous tissues may be so great, particularly about the seventh or eighth day, as to impede the free access of air to the lungs, and the same consequences ensue, especially in respect of the blood, as follow the extension of the complication to the bronchi and lungs. In either case, the blood does not undergo the requisite changes in the lungs, — it is no longer, or only imperfectly, oxidised or arterialised, and the following phenomena supervene: — The vesicles are flat, or, at least, do not acuminate, their contents are dark or ichorous, and the areolæ which surround them on the trunk and face are dark, or claret-coloured. Sometimes the surface presents a dark, erysipelatous appearance, attended by large watery blebs, or bullæ, from which an ichorous fluid escapes. On the succeeding day the tongue swells, and, with the lips and gums, exhibits a purplish hue; the extremities and nails become livid; low, muttering delirium is present; and either restlessness, anxiety, and dyspnœa succeed, or coma, distended bladder, or relaxation of the sphincters, takes place, and death soon afterwards supervenes.

41. The *digestive mucous surface* has presented changes more or less nearly approaching the pustular character, according to the accounts furnished by Riverius, Brendel, Wrisberg, Blane, and many others, and these have been

met with on the œsophagus, stomach, and small and large intestines. But the changes there observed, whether eruptive or pustular, have not been described with sufficient precision. Granting it to have presented somewhat of an eruptive appearance, it could not, however, have been pustular; for the nature of the tissues,—the structure of the parts, — admits not of a pustular formation. It is much more probable that, in the course of this as well as of other eruptive fevers, the glandular structures of the digestive canal become more particularly implicated, the morbid state of the blood exciting a special affection of these structures in the course of their functions, which have a very strict reference to the conditions of this fluid. In the most malignant or putro-adynamic state of this distemper, I have observed, especially in the dark races, the exudation of a dark, dissolved, or sanguineo-ichorous matter from one or several of the mucous canals, at an advanced stage of the distemper; an occurrence also observed in, and described when treating of, *putro-adynamic fever* and *hæmogastric pestilence*, and resulting from changes of a similar nature. In these, the alteration of the blood, and the loss of tone in the capillary circulation, admit of the exudation of blood from those parts or tissues especially, which, owing either to previous affection, or to loss of vital cohesion, are most prone to experience this change. (*See art.* HÆMORRHAGE, §§ 13. *et seq.*)

42. *B. The sub-cutaneous cellular tissue* is often implicated differently from, and even more seriously than, that which has been already cursorily noticed (§ 36.). In the discrete form, this tissue is rarely affected, but in the confluent or semi-confluent, and in the variety which Dr. GREGORY calls irregular or corymbose, the morbid action often extends deeper than the skin, and invades the cellular substance either partially or to a very considerable extent. According to this limitation or extension, the integuments are swollen and tense. When the scalp is affected, it becomes remarkably swollen, and resembles erysipelas of this part, excepting that it is attended or followed by a diffuse or confluent pustulation, or a succession of small abscesses. The salivation already described (§ 34.) is often accompanied with great swelling, more or less diffused, in the throat and neck. In some instances the tongue is involved; and when a diffused inflammation of the neck and throat thus extends to the tongue, an unfavourable issue then soon follows.

43. The cellular tissue in various other parts, especially where pressure is experienced, or where the vital cohesion of the tissue is the weakest, often becomes the seat of an asthenic inflammation, particularly in the more severe or malignant confluent cases. The sacrum, back, hips, elbows, scrotum, legs, and various other parts, may be the seats of boils or carbuncles, or of sphacelation. This change is most apt to appear during the secondary fever. Dr. GREGORY remarks, that he saw, at the Small-pox Hospital, an exact counterpart of the pestilential bubo and carbuncle in the groin of a small-pox patient. The face always suffers in these cases very severely; and if recovery takes place, it is not only pitted, but also seamed and scored by the cicatrizations consequent on the inflammation of the subjacent cellular tissue. Dr. GREGORY states, what I have also often noticed, that the disposition to suppuration of parts affected during the secondary fever of small-pox, appears to be universal and almost uncontrollable. In some few cases, the larger joints fill with purulent matter. Of the gangrene which so often occurs in the severe cases of variola, it may be remarked, that attempts should be made to prevent it, by attention and proper nursing and regimen, for in such cases it is often induced or aggravated by the absence of these, especially when the patient breathes an air rendered impure by putrid animal emanations, or contaminated by being too frequently respired, or breathed by too many persons.

44. *C. Ophthalmia* is a frequent and most important complication of small-pox. It has been unjustly stated, that the inflammation of the tissues of the eye is attended by the formation of pustules on the cornea and conjunctiva. But, although these tissues are very susceptible of the inflammatory states complicating this malady, they cannot admit of pustular formations. When inflammation implicates the eye, it may either be limited to the conjunctiva, or extend deeper, and even affect the whole organ. It is most disposed to take place when the changes in the skin arrest the natural functions of this surface, and when, with the secondary fever, there is a manifest contamination of the circulation, or some internal complication. The ophthalmia of variola may be the only prominent local affection, or it may be associated with others of an important or more dangerous nature. Dr. GREGORY remarks, that ophthalmia commencing on the tenth day of the disease sometimes advances so rapidly, that in forty-eight hours the whole eyeball is irrecoverably injured. The whole eye may even be converted into one large abscess. "More usually, the inflammation runs into some one of its less violent and more familiar consequences. An ulcer forms at the outer edge of the cornea, by which the aqueous humour escapes, or at which a staphylomatous protrusion of the iris takes place; or the aqueous humour becomes clouded, or specks form on the cornea, from which blindness, more or less complete or permanent, results. Many things concur to render it almost certain that the affection of the eye in small-pox is connected with some altered condition of the blood, and the retention of the vitiated matters which ought to have been eliminated." Of this there can be no doubt; for, as I have shown in various parts of this work, the depression of organic nervous power, and the contamination of the blood, superinduce all the complications observed in the advanced course of both continued and eruptive fever, and of other maladies impairing the functions of excreting and depurating organs.

45. *D.* It must be manifest that the *circulating fluids are more or less contaminated* by the poison of small-pox, whether that poison be communicated by the mucous or by the cutaneous surface. This contamination must necessarily exist in all cases of the malady, but in a very inappreciable amount in slight and benign cases; the eruption on the skin being its more prominent effect. Where, however, the vitiation is greater, and especially where the eliminating or excreting organs imperfectly discharge their functions, or where vital power is much depressed by either the primary or secondary operation of the poison, the circulating fluids, and particularly the blood, be-

come very remarkably and even sensibly altered. This alteration is manifested in various ways, but more especially in the advanced course of the malady; although it may be perceptible from the commencement of the primary fever. It is, however, more frequently noticed when the eruption appears, or at a later period, or when the eruption is proceeding to maturation. It is this contamination of the blood which, when more fully consummated, imparts the character of malignancy or of petro-adynamia to the distemper. This vitiation of the circulating fluids is rendered apparent, 1st., by the state of the blood when drawn from a vein; 2d., by the change in the appearance of the eruption; 3rd., by the hue of the surface in the spaces between the pustules, and by the lividity of the lips, tongue, and extremities; 4th, by the petechiæ, vibices, or ecchymoses, intermixed with the variolous papulæ or vesicles; 5th, by the filling of the vesicles with a bloody matter, or with a dark ichor, or even with dark, dissolved blood; 6th, by the passive hæmorrhages which occur from the mouth, or nose, bowels, or or urinary organs, or from the vagina, or from two or more of these outlets.

46. *a.* The more visible changes in the *blood* drawn from a vein are similar to those which I have described when treating of the *pathology of the* BLOOD (*see* §§ 125. *et seq.*), and consist chiefly of impaired crasis of the crassamentum, or a loose, gelatinous portion covering the black and hardly coherent portion of the coagulum. The alteration is often still more manifest in the blood poured out from one or more of the mucous canals, this fluid appearing as partially dissolved, dark, or ichorous, and being incapable of coagulating. — *b.* The *eruption* has at first a dingy or livid aspect; and as it proceeds to imperfect maturation, the vesicles fill only partially with a dissolved bloody serum, or with a matter containing the blood-globules changed to a blackish or brownish hue; and the vesicles are intermingled with petechiæ, &c., already mentioned. — *c.* The *general appearances* of these cases is often peculiar, and they are the most distressing and frightful manifestations of disease which can present themselves to our observation. The expression of the countenance is most anxious. The tumefaction of, and eruption on, the face; the exudations of blood from the mouth and nostrils; the closed, livid, and tumid eye-lids; the discharges from under them, or from the eruption; the swollen, softened, livid, or blackened hue of the general surface; the ichorous or bloody exudations from the urinary and genital organs and bowels, — all combine to impress the mind with an idea of a pestilence, exceeding in severity, and frightfulness of its aspect, both the plague and yellow fever; and to suggest the idea of a general dissolution or putrefaction of the structures, even before life has taken its departure, — a dissolution which has already partially taken place, in so far as that the tissues have actually lost a very large share of their usual vital cohesion, and have entered upon changes identical with those which appear soon after death.

47. The appearances now described are but rarely observed in the variola of the *white races*; yet I have met with them in a few cases, and in two or three instances the patients had been vaccinated many years previously. This malignant form of the malady was of more frequent occurrence formerly — before the introduction of inoculation and vaccination — than now, and was more common in some epidemic visitations of the distemper than in others. It was called by older writers, the *variolæ nigræ*, or black small-pox; and is, even now, the not uncommon form of the disease amongst the *dark races*, especially the *Negro*, and particularly when the distemper spreads by the respiration of miasms from the infected. When the adult female is the subject of this state of the malady, a most depressing or exhausting menorrhagia is apt to take place. I attended, some years ago, with Dr. GREGORY, a lady who was carried off by this form of small-pox. She had been vaccinated about thirty years previously, but she nevertheless presented the appearances just described. In this case, as in the following, mentioned by this physician in his work, the functions of the brain were not disturbed. "In February, 1842," Dr. G. remarks, "I saw, in consultation with Dr. L. STEWART, a lady in small-pox, whose whole body was the colour of indigo, and whom I at first believed was a native of Africa. She conversed with me in the most tranquil manner, and died a few hours afterwards, proving that the nervous system is not necessarily, nor is it even usually, implicated in the petechial form of small-pox" (*Op. Cit.*, p. 52.). This exemption of the brain from disturbance is very often met with in other malignant fevers, more especially in putro-adynamic fever, in malignant puerperal fever, in the hæmagastric pestilence, in plague and pestilential cholera, — maladies in which the circulating fluids are most signally vitiated. Dr. GREGORY has remarked, what I have reason to believe to be correct, namely, that death may take place in consequence of this remarkable condition of the blood, before any unequivocal signs of small-pox are developed, and has adduced two instances in which this appears to have occurred. Under common circumstances, the malignant or petechial form of variola exhibits an abundant confluent eruption, but this never makes much progress towards maturation. "Nature apparently gives up the struggle as hopeless. The patient is carried off very unexpectedly, perhaps on the fourth day, or from that to the sixth." But I have seen such cases sometimes protracted to the seventh or eighth day.

48. E. The *brain and nervous system* are often prominently affected in small-pox. This may occur at any age. Children are seized with convulsions on the accession either of the primary fever, or of the secondary fever; or they grind their teeth, roll their heads, scream, and squint. On these, inflammatory action, effusion, &c., supervene; or these changes have already taken place, to some extent, and occasioned these symptoms. In such cases, death very generally follows, either during an attack of eclampsia or convulsions, or with the usual signs of cerebral congestion and effusion. In older children and adults, the accession of the cerebral complication is attended by delirium of a violent or maniacal form — the *delirium ferox*. In some cases, the delirium is owing more to irritability of temperament, or peculiarity of constitution, than to inflammatory action; and in others, the nervous symptoms are attended by great depression of spirits, and by an inclination to commit suicide.

49. Dr. Gregory remarks, that "*a peculiar nervous affection* often supervenes on the tenth day, when the skin is extensively occupied by the confluent eruption, without nervous complication. It is identical with that which is familiar to surgeons as the consequence of extensive burns and scalds. General tremors, low delirium, a quick and tremulous pulse, a dry tongue, collapse of the features, cold extremities, and subsultus tendinum, are the symptoms of this nervous complication, and the precursors of a fatal event." (*Op. Cit.*, p. 51.) This is an accurate description of the unfavourable termination of a large proportion of confluent cases, as observed in weak constitutions, when the vital resistance is insufficient to oppose the depressing tendency of the distemper, or when the powers of life have not been sufficiently supported, or when support has failed to be efficacious. It is of great importance to recognise the accession of this state of sinking of vital power, in order to have a chance of opposing it with success.

50. *F.* Certain of the *bronchial and pulmonary complications* have been already noticed (§§ 36, 40.), especially such as arise from, or depend upon the contamination of the blood. But it is not unusual to observe a state of *bronchial irritation*, or *inflammatory action*, from the commencement of the febrile state, especially during the winter season. It may accompany the progress of the malady, without being materially increased, or without inducing a more violent form of the distemper. Frequently, however, and more especially in warm climates, or in the *dark races*, who have migrated to cold or temperate regions, the bronchitis extends generally to both lungs, and often to the substance of the lungs also, thus developing a form of congestive *broncho-pneumonia* (§ 39.). Sometimes associated with bronchitis, or with pneumonia, or occurring independently of either of these, *pleurisy* supervenes, and constitutes a most dangerous complication of variola. It has been noticed as follows by the able author just mentioned: — "Variolous pleurisy occurs between the twelfth and twentieth day. It is a peracute form of inflammation, remarkable for its sudden invasion, rapid progress, and invariable termination by empyema. The symptoms are very unequivocal: intense pain of the side, a hard or wiry pulse, shortness of breathing, great anxiety of countenance, a peculiarly pungent heat, and dry state of the surface, betoken but too forcibly the state of the pleura, even without stethoscopic aid. Blood-letting is almost powerless in this state of the disease. Death usually happens on the third, or, at farthest, fourth day from the invasion of thoracic symptoms." (*Op. Cit.*, p. 54.)

51. *Variolous pleurisy*, whether occurring as a complication or as a sequela, is not confined to the confluent, or any other form of small-pox. It may appear in the distinct or mild variety, or in the varioloid or modified disease, and in these forms it may be traced to exposure to a current of air, or to some other cause; and it may take place, especially when thus produced, at any stage of the malady. When it supervenes during the confluent distemper, and at the far-advanced stage, as just now described, it may justly be ascribed, as Dr. Gregory has inferred, to the morbid condition of the blood at this stage, — a cause which sufficiently accounts for the rapid progress and fatal issue of the complication. The variolous pleurisy, however, may not only be acute, or attended by very sensible indications of its existence, but also *latent*, until the consequent empyema or effusion has produced very manifest effects upon the respiration and blood.

52. *G.* The *heart*, *pericardium*, and *blood-vessels* are more frequently affected in a very prominent manner than has been generally supposed. — (*a.*) The *endocardium* and *pericardium*, either or both, may be implicated in the progress of the more severe forms of variola, owing to the alteration of the blood, produced either primarily by the variolous poison, or secondarily, by the absorption of a portion of the matter formed in the pustules, and by interrupted excretion; but, however induced, this complication is rapidly fatal, often without any other symptom than sudden sinking, and rarely with either pain or palpitation; more frequently with sudden anxiety and sense of dissolution.

53. (*b.*) That the internal surface of the *blood-vessels become asthenically inflamed*, as an advanced complication or sequela of small-pox, has been on several occasions witnessed by me at the infirmary for children since 1820; but I believe not so frequently as the endocardium and pericardium. The veins are certainly oftener implicated than the arteries, or, at least, more sensibly so, especially when the affection of the former gives rise to obstruction of the circulation through them. But, as I attempted to show many years ago, *asthenic phlebitis* may supervene in the progress of malignant distempers, and fail of producing lymph from their internal membrane capable of coagulating; the product of the morbid action being a fluid exudation, which passes into, and mingles with the blood circulating through the inflamed vessels, thus contaminating, or poisoning more fatally, the blood, heart, and blood-vessels.

54. *G.* The *purulent collections*, also formed within the capsules of joints, are rare complications or sequelæ of small-pox, yet they are not so rarely met with as to permit being overlooked. These deposits may be referred to the same series of changes, especially as regards the circulation, as have been noticed, and even fully discussed, with reference even to small-pox, when treating of purulent formations. (*See art.* Abscess, § 27. *et seq.*)

55. *H. Abdominal complications* are less frequent than the thoracic affections now passed under review. They are nevertheless sometimes met with, especially during the epidemic prevalence of the distemper; and oftener in some epidemics than in others. This circumstance is not always readily explained; although in some cases it may be referred to modes of living previously to, or at the period of infection, or to the water, or other peculiarities of the locality, or to the place of residence. — (*a.*) The most common of this class of complications are *diarrhœa* and *dysenteric affections*, sometimes leaving behind them, when convalescence has so far proceeded, diseased mesenteric glands, with emaciation and atrophy, as a sequela of the malady. Children, in unhealthy localities, are not infrequently affected by a mucous diarrhœa, or even with tenesmus and other symptoms of dysentery, in both the discrete and confluent forms of small-pox; the risk from this association being increased according to its severity.

In a few instances, blood is passed with, or intermingled with the stools to an amount which tends rapidly to sink the patient. If the stools be merely streaked with blood, the risk is less; but even these may indicate great danger.

56. (*b.*) Pain in the region of the *kidneys*, symptoms of congestion of these organs, and *hæmaturia*, are not uncommon in the severe states of the distemper, and are always to be viewed as most unfavourable occurrences, especially if the urine be scanty or suppressed. In cases of hæmaturia, the source of the sanguineous exudation has not been accurately determined, but there is reason to infer that it is the secreting structure of the kidneys; and that these organs are more frequently and seriously implicated in severe cases of this distemper than is commonly supposed. I do not say that they are so generally or so dangerously involved as in scarlatina, but this symptom, in connection with remarkable scantiness of the excretion, and an almost complete suppression of urine, have been remarked by myself and others sufficiently often to attract a more particular attention to the function of the kidneys during the course of the malady, and to the appearances they exhibit in fatal cases, than has hitherto been directed to them. It must be manifest, that even a partial impairment of the excreting offices of these organs, at any period of small-pox, must necessarily render the blood more and more vitiated, and superinduce various other dangerous or fatal results in vital organs, as I have fully shown when treating of *scarlet fever*. (See that *art.*, §§ 49. *et seq.*)

57. *I. Other complications* may occur, on rare occasions, in the course of variola, but they are very seldom detected during life, and more rarely looked for, or disclosed, on dissection. I shall only mention a few of those which have been noticed, and which should be kept in recollection during our dealings with this distemper: the presence of *intestinal worms*, which often aggravate the character of the disease, and which are often discharged at an advanced stage of the most severe and fatal cases; signs of inflammation, or congestion, or of functional disorder, of the *liver* or of its appendages, various changes in these parts being detected after death; intumescence of the *spleen*, and softening of this organ in fatal cases; one or other of the several forms of *erypsipelas*, or diffusive or asthenic inflammation of the cellular tissue; inflammation of the *urinary bladder*, and exudations of blood from the inner surface of this viscus; and a similar affection, with an imperfect development of pustules, vesicles, or papulæ, on the *labiæ vulvæ* and *vagina*; this last being very frequent, and very troublesome in some cases.

58. ii. SMALL-POX MAY COEXIST WITH OTHER SPECIFIC OR EXANTHEMATOUS MALADIES.—This is a rare occurrence, but one which should not be overlooked.—(*a.*) *Measles* coexist with variola more frequently, perhaps, than with any of the exanthemata. This combination has been observed, both distempers running their normal course, and uninfluencing each other, by DIEMERBROECK, DE HAEN, WEBER, TRACEY, KING, DELAGARDE, JONES, and others. MANGET says that measles delays the suppuration of small-pox, when both coexist; and ETTMÜLLER states, what is very surprising if it be true, namely, that he saw a case in which the eruption of small-pox broke out on one side, and that of measles on the other side.—(*b.*) *Scarlet fever* has also been seen coexisting with variola, both distempers pursuing their regular courses, by JENSENIUS, MALFATTI, KRÜGELSTEIN, MARSON, BARNES, and DESSESSARZ. Dr. GREGORY informs me, that he has seen, at the Small-pox Hospital, many unequivocal cases of the concurrence of small-pox and scarlatina anginosa; and that variola and cow-pox may coexist, as HOLM and others have contended. DESSESSARZ, who has paid much attention to the coexistence of variola with other specific diseases, mentions this concurrence of variola with *syphilis* and with *hooping-cough*, this latter delaying the eruption of variola, according to his observation. When vaccina and variola coexist, they may both run their usual course, or the one or other be more or less modified in aspect and progress.

59. iii. VARIOLA IN THE PREGNANT AND PUERPERAL STATES AND IN THE FŒTUS. — When a pregnant woman is seized with small-pox, abortion or premature labour may or may not take place, and the disease may or may not be communicated by the mother to the fœtus. Much depends upon the mild or the severe character of the distemper. If the disease be not very severe, the mother may not abort, and the fœtus may not be infected; but if the distemper be severe, confluent, or malignant, abortion takes place, as in nearly all instances of other malignant or pestilential maladies; the fœtus being dead, and furnishing proofs of its having contracted the malady. The communication of variola to the *fœtus* has been observed by H. AUGENIUS, FERNELIUS, DERHAM, FORESTUS, MEAD, MAURICEAU, KITE, MORTIMER, WRIGHT, FLINDERS, WATSON, DIMSDALE, HUNTER, LYNN, TURNBULL, PEARSON, and HAYGARTH. Dr. GREGORY remarks, that it does not necessarily happen that a pregnant woman, taking small-pox, conveys the disease to the child; several instances to the contrary have occurred at the Small-pox Hospital. An opinion was entertained by Dr. MEAD (but erroneously), that where a woman undergoes small-pox without aborting, the infant would remain through life unsusceptible, having, in fact, passed through the disease in utero. Dr. JENNER has detailed two cases, which prove very satisfactorily that a fœtus in utero may contract small-pox, provided the mother be exposed to the contagion, although she herself does not take it. "An infant, born under these circumstances, sickened for the small-pox five days after birth, and twelve from exposure to contagion." (*Op. Cit.*, p. 751.) In several collections fœtuses are preserved whose skins are covered with variolous eruptions. The earliest period of fœtal life at which Dr. GREGORY ever saw traces of variolous eruption is four months.*

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* The following abstract is taken chiefly from the American edition of Dr. GREGORY's work on "*Eruptive Fevers.*" Dr. MITCHELL (*Amer. Jour. of Med. Science*, vol. vii., p. 555.) adduces the case of a mother, who bore the marks of small-pox, with which she was affected in childhood, and whose infant was born in an apparently healthy state, but exhibited symptoms of variola three days after birth, and nine days after birth the pustules were in a state of complete maturity. M. DENEUX (*Ibid.*, vol. xi., p. 499.) instances the case of a woman who had been vaccinated and never had small-pox, but who bore an infant covered at birth with confluent small-pox in the eleventh or twelfth day of the eruption. Dr. C. GUOLI (*Ibid*, vol. iv., *new series*, p. 485.) states, that a child was born in June, 1841, covered with pustules of

60. When a pregnant woman is seized with small-pox so severely as to place her life in jeopardy, she aborts, the fœtus being generally dead; and the mother very rarely recovers. The abortion probably favours this event, especially if it be attended by much sanguineous discharge; but this event has taken place with equal rapidity where this discharge has been most remarkably small, or altogether wanting, as in a case which I lately attended with Mr. BARNWELL. The same issue is observed in respect of other dangerous maladies, especially low fevers, scarlatina, measles, and the several malignant and pestilential distempers. When small-pox is caught shortly before delivery, so that the fœtus is born before the disease has proceeded its full course, the fœtus is generally infected, and the distemper assumes in the mother a most severe and complicated or confluent form, recovery seldom taking place. I have seen several cases of variola in the puerperal state, infection having taken place before confinement, but I have met with only one in which the disease presented a mild form.

61. IV. OF THE CHARACTERS OF THE LOCAL AFFECTION AND OF THE FEVER.—*A.* The *local changes*, whether external, as evinced by the varying condition of the eruption, or internal, and constituting the contingent complications of the malady, present every phase or gradation of inflammatory action, from the most slight to the most disorganising, from the sthenic to the most asthenic, or that most rapidly passing into the dissolution of structure.

62. *B.* The *type of fever*, whether of that ushering in the disease, or of that developing the suppuration or maturation, also varies in respect of power and vital resistance, — as respects the organic nervous energy and the states of the circulation and circulating fluids, — from that which may be viewed as inflammatory, until it sinks into the most malignant and pestilential, passing, in different cases, through every intermediate type, form, or phase; the local changes always presenting a more or less intimate relation to the state or character of the febrile commotion. Nevertheless, however numerous the forms or states, either of the local changes or of the constitutional disturbance, this distemper, more remarkably even than any other specific disease, preserves all its special properties unaltered and unalterable, elaborates the same poisonous miasm and virus, and propagates its kind through innumerable generations, without changing or even modifying any of its features. The same now as it was twelve centuries ago, it has lost none of its qualities or attributes, and gained no new property. We observe it now as it was observed from the earliest periods of its history; with the same remarkable modifications in both the local changes and the constitutional disturbance, the slightest and most benign form of morbid action, and the most pestilential; each form, and each intermediate phase appearing in the same epidemic, in the same locality, and in the same family, the distemper, nevertheless, preserving its special nature and identity.

63. The very remarkable modifications of variola now described are to be imputed — 1st., to vaccination; 2d., to inoculation; 3d., to infection by the mucous surfaces, and especially by the respiratory passages; 3d., to the dose or the quantity of the poison which has infected the frame, par-

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variola. The pustules were at their height on the second day after birth, and maturated on the fifth; but the child died on the ninth day after birth. The mother had been vaccinated when an infant, and had escaped small-pox. M. GERARDIN (*Ibid.*, vol. vi., N. S., p. 210.) reported to the French Academy of Medicine, in 1842, an instance of a child born with the eruption in a state of suppuration; but no mention is made of the mother in this case. Dr. JOSLIN (*Ibid.*, vol. v., N. S., p. 249.) met with a case of small-pox in the fœtus, in New York, in 1842. The fœtus had on its body about 170 regularly-formed pustules, apparently such as they are from eight to ten days after the attack. The child lived only a quarter of an hour. The infection had been received by the mother just thirty days previous to the birth of the child. She was exposed but once to a single case, at the very commencement of the eruption, and for a single day. She had been vaccinated in early childhood, and the operation had been repeated on the day of exposure by Dr. JOSLIN himself, but without effect. M. DAPAUL (*Bullet. de Thérap.*, 30th April, 1849) saw a case of transmission of variola from a mother to her child, which had numerous pustules at birth. The mother had visited a person with the disease a short time before, without taking it. A case occurred in the Maternity Hospital, in Paris, in which the face, scalp, and different parts were covered with the pustules of small-pox at birth, though the mother retained the marks of vaccination, and had never had the small-pox. About ten days before, she had seen a patient at La Pitié, near another with small-pox (*Lancet*, 18th Feb., 1813, p. 741.). Dr. MEAD (*Works*, ch. iv., p. 253.) has recorded an instance in which a woman was delivered of a dead child at the full time, covered with variolous pustules. She formerly had the disease, and was attending her husband with it, when delivery took place. Dr. LEBERT (*Bullet. de Thérap.*, 30th April, 1849) exhibited to the Biological Society of Paris, a fœtus about four months old, whose body was covered with pustules of variola. The mother had the disease slightly, and aborted during her convalescence. Dr. KING (*New York Med. & Surg. Journ.*, April, 1840, p. 292.) mentions the birth of a living child at seven months, covered with umbilicated pustules, the mother having entirely recovered, and presenting at the time of its birth no evidences of the eruption, excepting the red spots succeeding the scabs; the child having been born twenty-one days after she was first attacked, or seventeen days after the appearance of the eruption. Dr. L. V. BELL (*Amer. Journ. of Med. Scien.*, May, 1836) adduces an instance of a lady who had confluent variola at the seventh month of pregnancy, and escaped without abortion, — a rare circumstance in confluent small-pox. At the expiration of her full term, she was delivered of a healthy child, whose abdomen and thighs were marked with decided small-pox pittings, and who was unsusceptible of the vaccine disease. VAN SWIETEN (*Commentaria*, vol. v., p. 8.) records, amongst several others, a similar case to the last; the child was born at the full time, with pits of small-pox, the disease having been transmitted to the fœtus through its mother, who had herself undergone the disease. Dr. HOSACK (*Med. Essays*, vol. ii., p. 111., & vol. iii., p. 473.) refers to numerous other instances, recorded by authors, of the communication of variola to the fœtus in utero.

"It will be found, on examination of the preceding and of other cases, that the communication of variola to the *fœtus in utero* has occurred after vaccination of the mother in infancy, and after her revaccination on the day of her exposure, and also after variola, both naturally and by inoculation. It has also taken place when the mother is yet suffering from the disease, and after she has passed through it years previously, and when she herself escapes entirely.

"The fœtus may be infected by absorption of the virus through the mother, without her experiencing any effect from it; or the disease may be transmitted directly by inoculation of the mother, and may be communicated any time from the fourth month (and perhaps earlier) to the full time. The fœtus may be thrown off in three or four days after cessation of motion, or may be retained for three or four weeks.

"The child may be covered with eruption at birth, and this eruption may present itself in different stages of its progress in different cases, even up to the eleventh or twelfth day of the eruption, or may not appear until three or four, or even seven days after birth. It may also be born at full time, with pits left by the disease some weeks previously."

The child either falls a victim to the disease at once, or lingers for only a few days; but it has been born healthy at the full time, with marks of previous disease; and it has survived when the disease, in a mild form, has appeared after birth. On this, and all other topics connected with variola, the admirable Commentaries of VAN SWIETEN on the Aphorisms of BOERHAAVE will be studied with advantage.

ticularly by these passages, relatively to the vital power and resistance of the patient; 4th, to the constitutional power, habit of body, diathesis, temperament, and health of the patient; 5th, to his race, or to the variety of his species; 6th, to his modes of living, mental power, and moral courage; 7th, to the physical agents which surround and influence him, especially the conditions of the atmosphere in respect of temperature and humidity, of purity and requisite renewal,—in short, to the various circumstances which I have pointed out, in full detail, when treating of the several causes and sources of pestilences, with reference to their removal and avoidance (*see art.* PESTILENCES, PROTECTION FROM); and, 8th, to the character or nature of the prevailing epidemic constitution.

64. According to the influence of these, either singly or in various combinations, the disease assumes a mild, or a distinct, or a severe, or a semi-confluent, or a confluent, or a complicated, or a malignant form, the primary and consecutive fever developing these several states, or at least presenting, conformably with them, and with strict reference to them individually, either a slight, or mild, or an inflammatory, or an adynamic, or asthenic, or a putro-adynamic, or a malignant character, the appearance of the eruption being one of the chief indications of the type or character of the fever. Certain of the modifying influences now enumerated may require a brief remark. The first four mentioned manifestly need no comment.

65. The *race*, or the *variety of the species*, to which the patient belongs, is of the greatest importance in modifying the distemper. The white race, especially that inhabiting northern and temperate climates, experiences a much milder and, more frequently, a discrete form than the dark races, particularly the Negro. Amongst the latter races, the disease more commonly assumes a confluent or malignant form, and is the most dangerous pestilence which can overtake them. It is to them what the hæmogastric pestilence is to the Europeans when they migrate to the hot countries where and when that pestilence is epidemic. Amongst the dark races this pestilence is comparatively mild, but most fatal amongst the white race; whilst the very opposite obtains in respect of *small-pox*. As to this, I speak from personal observation. There is nothing which can be conceived more pestilential than I have seen small-pox when it has seized upon a Negro town or community: the general malignancy of the distemper, the desertion of the afflicted by the healthy who have not passed through the disease, and the semi-putrid or decomposed and hideous appearances of those who are yet alive, but nevertheless exhibit much of the characters of structural dissolution, cannot fail of making a never-to-be-forgotten impression on the observer.

66. The state of the atmosphere is also very influential in forming the general character of small-pox. In dry, pure, and moderately cold or cool states of the air, this distemper is much milder and less prevalent than in hot seasons, and in humid and still states of the atmosphere. In countries enjoying the former atmospheric conditions, the malady is less generally and severely epidemic than in warm countries, where the latter conditions obtain; there are, however, frequent exceptions to this law that probably are dependent upon the unknown nature of epidemic constitutions; but this topic, and others connected with it, will be considered more fully in the sequel. (§§ 93. *et seq.*)

67. The form or character of the malady thus depending upon the circumstances now mentioned, and modified as above described, must, in the present state of our knowledge, be viewed as the result of agencies which tend either to resist or to limit the susceptibility and the poisonous properties of the miasm or virus which produces it on the one hand, or to increase that susceptibility, or to develope the injurious operation of these poisonous properties on the other. We observe, 1st., that a previous attack, with very rare exceptions, destroys the susceptibility of a second infection; 2d., that vaccination produces a similar effect, but for a certain time only, at least in many instances; 3d., that the mode of communicating the malady, which is the best calculated to secure the introduction of the smallest possible quantity of the poison into the system capable of infecting it, is the safest and best, namely, inoculation; 4th, that whatever tends to promote the excreting functions, to depurate the blood, to resist the contamination of the fluids, and to support the vital powers, also favours the production of a mild or discrete form of the malady; 5th, whatever has a contrary tendency — whatever occasions contamination of the blood, as a foul, close, or frequently-respired air, and interruption of one or more of those functions, by means of which effete or injurious elements are eliminated from the blood — developes a severe, a complicated, or a confluent and malignant form of small-pox; and, 6th, whatever reduces vital power and resistance at the period of infection, and favours the reception of a large dose of the poisonous miasm into the lungs, as in cases of infection by respiring the morbid emanation directly or closely from the sick, relatively to the susceptibility of the individual, generally gives rise to the dangerous varieties of the distemper just mentioned.

68. V. APPEARANCES ON DISSECTION. — The changes which more especially belong to small-pox are those observed in the skin and mucous surfaces. Those of the skin require no remark. The rare exception, however, of death occurring either before the eruption has appeared, or at a later period, when the amount of internal disease, or the poisoned state of the blood, has prevented the evolution of the eruption, should be kept in recollection. The pharynx, larynx, and trachea generally display more or less disease, especially in cases which have proved fatal from the seventh to the tenth day. The mucous membrane of these parts appears covered with viscid, puriform matter, more or less copious, and of a brownish or greyish colour. Underneath this, the membrane is generally found congested, softened, thickened, and pulpy; and in the more malignant cases it is black and sloughy, and exhales an offensive odour. Congestion, softening, discolouration, &c., with a muco-puriform or sanguineo-puriform exudation, may often be traced down the trachea, and thence to the bronchial ramifications to a greater or less extent. The lungs frequently evince congestive or inflammatory appearances, or rather such changes as may be referred to a congestive pneumonia, or this associated with bronchitis, or an alteration approaching in appearance to that of

splenisation, with or without a puriform infiltration. The pleura is often inflamed, but it presents no changes different from those which are often seen in asthenic inflammations of serous membranes, occurring in the course of other exanthematous and adynamic fevers. As in these, so in this, the inflammatory affection is attended by injection, softening and thickening of the membrane, with an exudation of lymph forming a layer varying very much in thickness and density. These changes extend more or less to one or even to both sides; the cavity of the pleura also containing much sero-puriform fluid resembling a dirty whey, or a mixture of milk or cream and water.

69. It was believed by many that, in the dangerous states of small-pox, a pustular eruption took place in various portions of the digestive canal; and there can be no doubt of considerable alteration being observed in this quarter. These alterations may have assumed a papular or vesicular form, or one approaching the appearance of pustules, when the follicular glands of the digestive surface were chiefly inflamed. These changes have been remarked in the œsophagus, in the stomach, and in the small and large intestines. Dr. GREGORY remarks, that "much discussion has taken place regarding the occurrence of variolous pustules on the gastro-enteric mucous membrane. COTUGNO, WRISBERG, REIL, and others, who have paid great attention to the subject, concur in opinion that this structure is not capable of developing them. Sir G. BLANE, again, reports a case where this membrane presented the appearance of ulcerated spots, which he compared to variolous pustules. The experience furnished by the Small-pox Hospital is in favour of the old doctrine. Inflamed, enlarged, and ulcerated follicles, with petechial patches, may indeed be noticed in a few cases; but such changes are in all respects the same with those observable in typhoid fevers." I have seen ecchymoses with or without those alterations, in the digestive mucous surface, and in the internal surface of the urinary bladder, but much more rarely in this latter situation. The kidneys are often congested, and the internal surface of the pelvis of the kidneys is also congested, softened, and discoloured. But these appearances, as well as those observed in the brain and its membranes, in the spleen, liver, and biliary organs, are very much the same as those seen in fatal cases of the other exanthemata, and of low or malignant fevers.

70. IV. DIAGNOSIS OF SMALL-POX. — It is not easy, and, indeed, seldom even possible, to distinguish the primary fever of variola from that of the other exanthemtaa, or even from the commencement of continued fever. In children, however, there is a more frequent occurrence of convulsions, more sudden and severe vomiting, and pain at the epigastrium, than in these; and in adults the muscular and other pains are more severe.—(*a.*) The fever of *measles* is more generally attended by cough and watering of the eyes than that of variola; and the eruption is about twenty-four hours later in the former than in the latter. The papulæ of small-pox are firmer and deeper seated than those of measles, which are superficial, and do not give so knobby or so granular a sensation to the touch as those of the former, which implicate the cutis vera.

71. (*b.*) *Febrile lichen* may be confounded with small-pox; but the interval between the occurrence of rigor and the appearance of eruption is much shorter in the former, generally only twenty-four hours, or half the time of that of the latter. The eruption of variola generally appears first on the face, whilst that of lichen takes place uniformly over the head and trunk, is superficial, and devoid of the granular feel to the touch which belongs to variola. (*See art.* LICHEN.)

72. (*c.*) A form of *secondary syphilis* sometimes occurs, in which the eruption over the face and trunk is very similar to distinct small-pox, and passes through the grades of papulæ, vesicles, and pustules. It is, however, generally preceded by little, or by a slighter fever, and the eruption is much more tedious in its development than that of variola; the pustules do not maturate, or proceed simultaneously, but irregularly, or in successive crops. The general aspect of the patient, and the history of the case, will farther assist the diagnosis.

73. (*d.*) The diagnosis between *variola* and *varicella* has been fully discussed, and the distinct natures of these have been shown at another place; but independently of various other points of difference, the impossibility of inoculating the latter, the occurrence of it after cow-pox, and even after small-pox, and the absence from varicella of the deep-seated granular sensation to the touch, and of the umbilicated vesicle, characteristic of the variolous eruption, sufficiently distinguish the one from the other.* (*See art.* CHICKEN-POX, §§ 2, 3, 10, 11.)

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* The following remarks respecting the distinct nature of *Chicken-pox* and *Small-pox*, contained in Dr. GREGORY's excellent work, already referred to, deserve perusal, and quite agree with my own observation. "The first thing I observe in varicella is the eruption of vesicles of the size of a split pea, being simple elevations of the cuticle, or minute blisters. The parts chiefly occupied by the eruption are the back and scalp. The face is not so universally the seat of eruption as in variola; nevertheless, at times, the face is extensively occupied. The vesicles vary in shape; Dr. WILLAN, who loved minuteness, wishes to distinguish three kinds, — the lenticular, the conoidal, and globate. I cannot see these distinctions myself. The vesicles are surrounded by a superficial and narrow areola. They appear in successive crops for two or three days. While the new vesicles are forming, the old ones shrivel and dry up. On penetrating the vesicles, a clear lymph, scarcely at all mucilaginous, escapes, and the cuticle falls to the level of the surrounding skin. There is no tumour, no varus. If the vesicles remain unbroken for twenty-four hours, the contained fluid becomes slightly opaque. They are very itchy, and when rubbed, a degree of superficial inflammation may succeed, sufficient to convert the lymph into an imperfect pus. The scabs of varicella are very small, and as the lymph is wanting in mucilaginous quality, they are granular. The desiccation is very rapid, and in six days the complaint completes the whole cycle of its phases. No constitutional symptoms of much importance are present. The complaint often shows itself in schools, and runs through all the young members of a family. It is manifestly infectious and epidemic."

Varicella almost exclusively attacks children, it is very rarely seen in adults. "It is taken indiscriminately by those who have and those who have not been vaccinated. It is now nearly always taken *after* vaccination. Whether it was taken equally after inoculation of small-pox I cannot tell from my own experience, but I have the authority of the late Sir HENRY HALFORD for saying that it was. These general considerations are of themselves sufficient to decide the question of non-identity. But if we examine the subject still more closely we find that the organization of the varicelloid vesicle differs from that of the variolous; there is no umbilication, no central depression, no slough. There is simply elevation of the cuticle, of irregular and undetermined arrangement. Here we see no groupings into threes, or fives, — no crescentic or circular figures formed. Everything in varicella is hurried forward — the incubation, the eruption, the desiccation."

74. V. THE PROGNOSIS OF SMALL-POX is tolerably manifest from what has been already stated. The circumstances enumerated above as modifying and aggravating the fever of small-pox (§§ 63. *et seq.*), increase also the *danger* of the distemper; but the following more especially tend to this: — 1st. The quantity and confluence of the eruption. 2d. The state of the circulating fluids. 3d. The presence and nature of the complications, especially those of the respiratory organs and nervous centres. 4th. The age, habit of body, and temperament of the patient. 5th. The circumstances and influences under which the patient is placed; and 6th. The season, temperature, and epidemic constitution in which the disease occurs.

75. *a.* A *confluent form* of the malady should, even when proceeding favourably, be viewed with distrust; for, in children, a fit of convulsion may occur, and carry off the patient; and in adults the blood may become contaminated to an extent incompatible with the continuance of life; or the secondary fever may further implicate vital parts. If the vesicles on the trunk and extremities be flat, with a claret-coloured or livid areola, "while the eruption on the face is white and pasty, no reasonable hope of recovery can be entertained." An excessive quantity of eruption always tends to depress vitality, to vitiate the blood, and to favour the occurrence of internal complications, which concur with these to destroy life. On the other hand, if the pustules on the extremities acuminate, and exhibit a crimson areola, a good ground of hope is furnished.

76. *b.* The *contamination of the fluids*, as shown by the hue of the surface, the colour of the lips, tongue, and gums, so far as they can show it; by the appearance of the vesicles; by the state of the evacuations; and by whatever indicates a tendency to putrescency, or a partially dissolved state of the blood and depressed organic nervous influence, is extremely dangerous. Petechiæ, ecchymosis, gangrenous, or sloughing, sores; hæmorrhages from mucous canals, the blood being dark, dissolved, or ichorous; menorrhagia, or hæmaturia; the vesicles being filled with a dark, bloody, or ichorous matter; purulent depositions in the joints, &c., are generally fatal indications.

77. *c.* The occurrence of any of the *pulmonary complications* mentioned above; cough or hoarseness at an early period of the disease; hæmoptysis at a more advanced stage; bronchitis, or congestive pneumonia, or asthenic pleuritis, especially when either extends to both sides, are extremely unfavourable. The appearance, also, of an abundant or confluent eruption in the puerperal states, and particularly soon after parturition, is always attended by the utmost danger.

78. *d.* The state of the *nervous system* is most important in the diagnosis. Continued delirium, or prolonged want of sleep, restlessness, moaning, despondency, or an inward persuasion of death, or an apathetic condition, or unconcern as to the result, so frequently observed in pestilential maladies, suppression of urine, sopor, lethargy or coma, leipothymia, or a tendency to faint upon raising the head from the pillow, or attempting to sit up, are severally dangerous or fatal symptoms.

79. *e.* The *age* of the patient is of much importance in the diagnosis, especially in confluent and semi-confluent cases. Dr. GREGORY remarks, that "the extremes of life are those on which small-pox always falls the heaviest. Persons above 40 years of age seldom recover even from the semi-confluent small-pox. Children are in danger from an amount of eruption that can scarcely be called semi-confluent. In both, the processes of maturation and cicatrisation are attended by great exhaustion of nervous power, the result of which is often the setting up of acute inflammation in an internal organ essential to life — either the brain, the larynx, or the lungs. The most favourable age for taking small-pox is from the seventh to the fourteenth year, when the powers of life and reproduction are in their fullest vigour."

80. *f.* The *habit of body and diathesis* have considerable influence on the result. A plethoric habit of body, a sanguine, a melancholic, a leucophlegmatic, or a bilious temperament, constitutional asthenia or debility, and a scrofulous diathesis, are more or less aggravating circumstances, as respects either the severity of the disease, and abundance or confluence of the eruption, or the complication and sequelæ of the malady.

81. *g.* The circumstances which indicate a *favourable issue* are, a discrete form of the disease

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There is a form of Small-pox which, in some of its features, and from its mildness, may be mistaken for varicella; "and physicians in former times, looking only to the general, and neglecting the minute anatomical characters of the eruption, have thought proper to confound the two diseases. By way of distinction we will call the one *varicella vera*; the other, *variola varicelloides*. In the true varicella there is little or no premonitory fever. In the variola varicelloides there are at least forty-eight hours of preceding febrile disturbance. In the varicella vera there are no hard vari or tubercles. In the varicelloid form of variola, tuberculous elevations of the skin are distinctly perceptible. In the vesicles of the one there are no central depressions, in the other central depressions exist." In true varicella the crusts quickly fall off, and rarely leave any pits. Can varicella be communicated by inoculation? "Dr. WILLAN entertained the belief that it can; but his experiments are few (two or three only), and these few, to my mind, very unsatisfactory. Since his time, Mr. BRYCE, by more extended and more careful investigation, has set the question at rest. He states that he has inoculated with the fluid of varicella vera, at all periods of the disease, and at all seasons of the year, children who had never undergone either small-pox or cow-pox, and yet that he had never been successful in producing from it either variola or varicella. Since the date of BRYCE's experiments (1816), I know of none on the inoculation of varicella."

What, then, are the arguments which can be brought forward in support of the doctrine of the identity of small-pox and chicken-pox? I have adduced the arguments which have been urged by Dr. THOMSON, and others in favour of this doctrine, and I have answered them seriatim in another place (*see art.* CHICKEN-POX, §§ 2, 3. 10, 11.); but, nevertheless, it is interesting to know what further Dr. GREGORY has stated as to this topic. Dr. THOMSON's great argument is, "that varicella presents itself when variola prevails, and never without. Hence," says he, "we may deduce the probability that one contagion is operating, not two." The answer to this is, that the facts are incorrectly stated. Varicella frequently prevails without variola. Dr. MOHL has shown this most satisfactorily from the experience of the Copenhagen epidemics. From 1809 to 1823, Chicken-pox was annually observed at Copenhagen without accompanying variola; since 1823 both diseases have prevailed epidemically, but the physicians could always trace their sources, and this convinced them that the generating miasms were distinct. Besides, the doctrine goes for nothing if it can be shown, as has been shown over and over again, that some children take varicella after cow-pox, and others cow-pox after varicella, while sometimes both diseases may be seen going through their phases at the same time. "It cannot be doubted for one moment, after reading the details of this controversy in the works of Dr. THOMSON and elsewhere, that a very large proportion of the cases of alleged secondary or recurrent small-pox, are really cases of genuine lymphatic varicella mistaken for small-pox;" or, I may add, that the supposed first attack of variola was merely that of varicella.

the absence of any symptom of complication; a natural tone of the voice, and freedom from cough and hoarseness; an age between six and twenty-six; the occurrence of the malady at a cool, dry season, and under other favourable influences, as respects air, ventilation, and healthiness of position.

82. *h.* Much, however, depends upon the state of the patient before the accession of the malady, upon the influences in operation during the treatment, upon the measures which have been employed at the commencement of the distemper, or during its earlier stages; upon the purity of the air, and the ventilation of the patient's apartment; upon his nursing, and the noninterference of friends; upon the character of the prevailing epidemic, or of the reigning epidemic constitution; and upon various subordinate circumstances and unexpected contingencies.

83. VI. The Causes of Death from small-pox are, 1st., during the first week, or prior to the maturation of the eruption, the poisonous influence of the variolous miasm or virus on the blood, and the consecutive effects of the poison on the organic nerves and nervous centres; 2d., during the second week the greater number of deaths occur, and the most common cause is asphyxia, or consecutive vitiation, and interrupted oxidation of the blood, owing to the prominent affection of the respiratory passages, or of the lungs, or to suppression or interruption of the urinary excretion; 3d., during the third week, or when secondary fever has advanced, death may be produced by effusion on the brain, or by effusion in the pleura, or in the pericardium, or by the complications which occasion it in the second week; or by gangrenous destruction of some portion of the integuments; 4th, during the fourth, or following week, death may result from erysipelas, or from some other complication or sequela of the distemper. The following table, furnished by Dr. Gregory, exhibits the days on which 168 cases of small-pox were fatal at the Small-pox Hospital in 1828–29, and proves that no importance can be attached to critical days in this distemper:—

Days.	Fatal Cases.	Days.	Fatal Cases.	Days.	Fatal Cases.
3d.	1	13th.	11	24th.	2
4th.	5	14th.	5	25th.	1
5th.	10	15th.	7	27th.	1
6th.	5	16th.	5	28th.	1
7th.	11	17th.	3	29th.	1
8th.	27	18th.	3	31st.	1
9th.	15	19th.	1	32d.	1
10th.	14	20th.	2	35th.	1
11th.	16	21st.	3	36th.	1
12th.	11	23d.	1	39th.	1

Table exhibiting the total Number of persons having Small-pox, admitted into the Small-pox Hospital of London, in the Years from 1841 to 1850, inclusive, with the Proportion of Cases admitted *after Vaccination*, and the Mortality in each Class respectively.

Years.	Total Admissions of Persons having Small-Pox.	Deaths.	Per Centage of Deaths.	Total of Persons vaccinated with Cicatrices.	Deaths.	Per Centage of Deaths.	Total of Persons unprotected, including the Vaccinated without Scars.	Deaths.	Per Centage of Deaths.	Per Centage of Admissions after Vaccination with Scars.	Persons professing to have had Small-pox previously.	Deaths among Ditto.
1841	342	74		151	10		191	64		44	2	1
1842	141	34		62	4		79	30		44	1	0
1843	149	27		69	0		80	27		46	2	0
1844	643	151		312	24		331	127		50	3	2
1845	367	79		217	13		150	66		60	3	0
1846	147	29		77	5		70	24		52	2	0
1847	450	81		230	17		220	64		51	8	3
1848	686	168		365	38		321	130		53	4	2
1849	190	33		115	11		75	22		60	4	0
1850	307	5 8		155	8		152	50		50	1	0
Total in 10 Years.	3422	734	22	1753*	130	7	1669 †	604	36	51	30 ‡	8

84. VII. Causes of Small-pox. — i. From the earliest accounts of small-pox to the days of Boerhaave, variola was considered to owe its origin to the same causes, with certain unknown modifications, which give rise to other epidemic maladies, aided by infection and contagion. It was thus believed that small-pox might be generated *de novo*, from some defect or vice in one or more of the six non-naturals, — air, aliment, the secretions, exercise, sleep, and mental emotions, but that when thus produced it would spread by infection. Boerhaave was the first to contend that this doctrine was incorrect, and that small-pox was in all cases the product of a specific miasm or poison, derived from the same malady. "He acknowledged that the miasm must originally have sprung from some fortuitous combination of common causes, and that what had happened once might happen again, but he held that this contingency was improbable, and might safely be excluded from our reasonings."

85. It is impossible to say, with any degree of confidence, in what source, or in what combination of causes, or under what influences, the poisonous miasm first constituting and afterwards perpe-

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* Nearly the whole of these 1753 cases were above the age of fifteen years.

† Many of the persons alleging to have been *vaccinated*, but not showing cicatrices, were doubtless duly vaccinated; but to distinguish such cases from the others was impossible.

‡ N. B. The persons professing to have had small-pox at some former period, sometimes announced themselves to have been inoculated, sometimes to have had the casual small-pox, but in no one instance was there any corroborating evidence of the truth of the statement. These cases, therefore, are included in the third column of "*persons unprotected*."

tuating the disease was produced. There is some reason, however, to infer, from what we know of the origin of certain distempers, and of the communicability of them from the lower animals to man, and from the proofs of the causes, and of this communication of these distempers, furnished by the old historians, as shown in the articles Epidemic Influence (§§ 12. *et seq.*) and Infection (§§ 4. *et seq.*), and by modern pathological and other writers, that this malady, as well as they, originated in the lower animals, and extended from them to the human species by infection or contagion. However this may be, there is no proof that the disease appears or becomes epidemic, after longer or shorter intervals, owing to certain combinations of causes or influences, producing it *de novo*. On the contrary, there is every reason to infer, that it is perpetuated by its miasma, or effluvium, or virus, which spreads it by infecting the healthy, either directly, or indirectly by the media of substances — of *fomites* — which preserve, for longer or shorter periods, and thus propagate the poisonous agent (*see art.* Infection, §§ 16. *et seq.*); and that this distemper has been thus perpetuated since its first appearance in the 6th century. Instances are constantly occurring of either single cases, or of the outbreak of several or of many cases, without proofs of antecedent infection or contagion having been obtained, especially as respects the earliest cases. But as regards these, all the preceding circumstances or occurrences may not be known, or even may not admit of recognition; and as respects many of these, the same or similar circumstances may have taken place to those which occurred in the following case adduced by Dr. Gregory:— A child took the small-pox, in the country, under circumstances which seemed to exclude all suspicion of infection. She had never left the house for several weeks; the few neighbours who had called were free from sickness, and no small-pox existed in the neighbourhood. During her convalescence, a looking-glass being put into her hands, she immediately said, "My face is exactly like that of the child at the door, from whom I bought the beads." On inquiry, it was found that some pedlars had passed through the village, and that the child had been to the door, although she had never left the house. Had this child died, or been an inattentive observer, the origin of this attack of variola must have remained for ever mysterious.

86. When we consider the facts connected with *infection*, as I have shown in that article, and the long periods during which the infectious miasm may be retained by fomites without losing its specific character and operation, and connect this with the numerous substances which may thus become the media of infection, and with the many occasions on which one or other of these media may have come within the sphere of our senses, without our recollection or knowledge, — and, moreover, when the long period which elapses from the moment of exposure to infection to the manifestation of the distemper is taken into account, the frequent difficulty or impossibility of accounting for the infection cannot be a matter of wonder. The poisonous miasm of small-pox is given out from all the mucous, cutaneous, and excreting surfaces,—especially the lungs and skin, — the exhalations, the secretions, the excretions, the matters in the vesicles and pustules, and the scabs, all contain this poisonous material, with all its specific characters; and this material attaches itself to many dissimilar substances, especially to the bed clothes, body-clothes, woollen and cotton articles, &c. These when wrapped up, or in any way excluded from the free action of the air, retain the specific miasm for a very long but indeterminate time, and give out this miasm when opened up and exposed to the air.

87. The length of time during which fomites will retain the infectious miasm, with all its properties unimpaired, has not been ascertained; but there is reason to believe that, when they are excluded from the air, this miasm may be preserved for many months, or even for some years. The stages of the distemper during which the infectious emanation is most abundant and noxious, have been variously estimated, but without any accurate data. There is every reason to infer that the disease may be communicated by respiring the air containing the morbid effluvium from the commencement of the eruptive fever; and it may be admitted, that the infectious miasm is most powerful or concentrated when it is most manifest to the sense of smell. The dried crusts of the pustules, or scabs, not only also possess a contagious quality, but also retain this quality for a very long time, especially when shut up from the atmosphere, or undecomposed; and the dead body possesses also the power of infection, both by the effluvium which it exhales, and by the matter in the pustules. How long this power continues after death, has not been determined with precision, but it may last from a week to a fortnight, according to the exposure of the body to the air, and to the temperature and humidity of the atmosphere.

88. The distance at which the infectious property may be exerted, has been variously estimated by Dr. Haygarth and others. Some suppose that the sphere of infection does not extend further than a few feet, whilst others contend that it may extend to many hundred feet. An American physician informed Dr. Haygarth, that the infectious effluvium crossed a river 1500 feet wide, and affected ten out of twelve carpenters at work on the other side. The sphere of infection mainly depends upon the state of the atmosphere, and the existing epidemic constitution: a still, warm, humid, and impure air extending the sphere of infection; and a cool, dry, and pure air, and free ventilation, circumscribing this sphere, by diluting and dissipating the poisonous miasm.

89. It is obviously of importance to ascertain what degree of cold and heat, or what proportion or amount of chlorine gas, or of the chlorides in solution, is capable of destroying the poisonous miasm or virus contained in fomites, in order that these agents may be employed in disinfecting bed and body clothes; but our knowledge of the disinfecting powers of these agents, although considerable, requires much greater precision than it at present possesses. There is, however, sufficient reason to believe, that a temperature of about 200°, or somewhat above this range, is sufficient to destroy the infectious property, and that these chemical agents produce a similar result in moderately concentrated solutions.

90. During the last century, and even at the commencement of the present, a singular notion as

to the origin of small-pox, and as to the possibility of the entire extirpation of the distemper, was promulgated, and even entertained by some respectable writers, namely, that small-pox was generated *de novo* in infants by the blood of the mother left in the portion of the umbilical chord, attached to the fœtus on tying the chord—that the fluids remaining in this portion of the chord being absorbed by the fœtal vessels, thereby contaminated the blood and frame of the infant, and thus developed anew the distemper under consideration, independently of infection or contagion received from any other source. It was therefore recommended by these writers, in order to prevent the generation of the distemper, and ultimately to procure its entire extirpation, that the portion of the chord attached to the fœtus should be thoroughly emulged, and the fluids pressed out of it, upon securing it at delivery. That small-pox neither originated in this source, nor can be extirpated or prevented by any method of managing this operation, will not be disputed at the present day, however great importance may be attached to it in other respects.

91. ii. *The causes predisposing to, or increasing, the susceptibility of the infection of small-pox* are not wanting in importance.—*A. A very early age* has much influence in predisposing to this distemper. It has been admitted by Dr. HAYGARTH and other writers, that the greatest mortality by small-pox takes place in the early periods of life. In 1795 (before the introduction of vaccination), it was computed that, in Chester, nearly half the deaths among children below ten years of age was due to small-pox. From the data furnished by Mr. FARR's first and second reports, it appears that out of every hundred who died of small-pox in England, seventy-five were below the age of five years. Of 9,762 persons, who died of this disease in England, in 1837 and 1838, there were 7,340 under the age of five years; 1,668 between the ages of five and fifteen years; 528 between fifteen and thirty; 210 between thirty and seventy; and 16 upwards of seventy years of age. Of 2,285 persons who died of small-pox in London in 1840 and 1841, 2,060 were under fifteen years of age. During the last quarter of the last century (from 1775 to 1800), that is, prior to the discovery of vaccination, the proportion of the mortality by small-pox to the total mortality, was as 8 to 100 in London; and it was probably the same throughout the country. From the commencement of the present century, the proportion has varied much, rising in years when small-pox was prevalent, as in 1838, as high as this, and in other years falling far below it.

92. The susceptibility of infection exists in all persons who have not had the disease, and who have not been vaccinated, but in various degrees: it is greatest in infancy and childhood, and least in advanced age. Dr. GREGORY, however, thinks that this greater mortality from small-pox does not depend upon a greater susceptibility of infection, but because the disease is usually contracted on the first exposure to the infectious miasm. There can be no doubt of this being the case, but it is chiefly owing to the susceptibility being so remarkable at this age. Numerous exceptions have, however, been remarked to this general susceptibility. Both before and after the introduction of inoculation, many persons were frequently exposed to infection without experiencing the disease; and this circumstance, which is common to all infectious and pestilential maladies, was most ignorantly urged by non-contagionists as an argument against the existence of an infectious property; they either not adverting to, or concealing the fact, that many of those who thus appeared quite unsusceptible of infection, had the disease communicated to them by inoculation. "A lady, in 1804, was successfully inoculated for small-pox at the age of 83, and lived several years afterwards. She had brought up a large family, most of whom she had attended in attacks of small-pox, but had never taken it herself." I shall have to show in another place, that the susceptibility which, in vaccinated persons, is destroyed for some years, returns with advancing age, and becomes greater as life advances.

93. *B.* The several causes which predispose the system to the infection of other pestilential maladies, have a similar effect in spreading small-pox. Of these the most manifest are diathesis, or peculiarity of constitution; humid and warm seasons and states of the air; a close and stagnant or impure atmosphere; fear of infection; an endemic or epidemic constitution, favourable to the diffusion or operation of the poison; arrival from a pure and healthy air into a locality in which the malady is prevalent; and the constitution of the Negro and dark races.—*a.* A delicate conformation and susceptibility of the nervous system, a scrofulous or other diathesis existing in families, and exhaustion or depression by previous disease or other causes, either predispose the frame to infection, or render the malady more severe.—*b.* A high range of temperature*, especially when conjoined with humidity, stillness, and impurities, arising from animal or vegetable decomposition, both predispose the frames of those who are subjected to these causes, and concentrate the poisonous miasm emanating from the sick, and spread this miasm in a wider sphere.—*c.* Fear of being attacked, by depressing vital power, lays the body more open to the invasion, as in all other pestilential maladies.—*d.* There is something in the state of the stationary epidemic constitution which certainly influences variola and other epidemic distempers, and which we are unable to demonstrate otherwise than in the characters of its results; but although the epidemic prevalence of small-pox may be limited to a particular place, or extended over a whole country, either in cold seasons or weather, or in warm seasons and countries, yet it is most severely and generally prevalent in these latter circumstances.—*e.* The constitution of the dark races evinces a remarkable susceptibility of variolous infection. The destructive epidemics which have occurred in warm climates, and in the western world, il-

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* BOERHAAVE, one of the ablest illustrators of the pathology of small-pox, states, "Est ut plurimum epidemicus, verno tempore primo incipiens, æstate crescens, languens autumno, hyeme sequente fere cedens, vere iterum eodem ordine rediturus." The truth of this was shown in the course of the Norwich epidemic of 1819, when a few cases only were observed in the preceding winter, and the greatest prevalence and mortality were in June and July. Small-pox was introduced also into the town of Lynn at the commencement of this year, but did not spread with rapidity until summer. A knowledge of this circumstance induces the native inoculators in the East to inoculate the small-pox in the cool season.

lustrate this fact. Although in many of these much may be attributed to the high range of temperature, humidity, and other concurring causes, nevertheless much more should be assighed to peculiarity of constitution, as evinced by the remarkable prevalence and fatality of the distemper when introduced into America among the natives of all climates and localities in that quarter of the globe.

94. *C.* There are certain circumstances, *apart from vaccination*, which influence not merely the susceptibility, but also the character of the malady. Those just mentioned (§§ 91. *et seq.*), whilst they increase the former, have generally a very remarkable influence in augmenting the quantity of the eruption and the severity and malignancy of the distemper. — *a.* The character of the case generating the infection has no influence upon that produced by it, whether the infection has taken place through the medium of the lungs, or by inoculation; a discrete case may occasion a confluent or malignant one, or this latter the former. This may arise from the susceptibility, or constitution, or diathesis of the infected, or from the quantity or concentration of the poison inhaled in a tainted atmosphere. The general mildness of the distemper, when inoculated, may be the result of the small quantity of the poison which may be administered in this way. — *b.* The best state of health, or vigor of constitution, may favour the occurrence of infection, but it will also favour the appearance of a mild form of the disease; whilst unhealthy or cachectic states of the frame, or some pre-existing disorder, may diminish the disposition to be attacked, and yet may render the distemper more severe or malignant when the infection is once produced. — *c.* Certain physical and other influences or circumstances may concur with the first manifestation of disorder to render variola mild, or discrete, or confluent, or malignant. Some of these, especially high temperature and impurity of the air, have been already noticed (§ 93.), as tending to aggravate the malady. Whatever determines the circulation to the surface, as warm baths, cordials, a heating regimen, too many bed-clothes, stimulating diaphoretics, a plethoric habit of body, and external irritants, increase the quantity, or favour the confluence, of the eruption; whilst a cool, dry air, large and well-ventilated apartments, a cooling regimen, and active purgatives taken during the latent period, or at the commencement of the primary fever, diminish the quantity of eruption, determine the circulation from the external surface and lower febrile action. Vascular plethora, especially if accompanied with more or less excrementitial accumulations, favour not merely a confluent or malignant form of the distemper, but many of the complications described above (§§ 44. *et seq.*). Extreme debility, weakness of constitution, and anæmia, delay the eruption, and impress the malady with a nervous or asthenic character.

95. *F. Epidemic visitations* of small-pox observe several of the same laws as govern the recurrence of other epidemic pestilences: — 1st. They return to a locality after a varying number of years, the intervening years presenting merely a few cases. This may, in some measure, be owing to the numbers of susceptible or unprotected cases having become, after many years, so numerous, as to furnish a sufficient supply to an epidemic outbreak; the straggling or few cases usually met with readily extending the infection to the accumulated mass of susceptible persons, as soon as states of air and other influences concur to predispose their constitutions to this result.

96. 2d. These visitations are characterised by greater severity, and are attended by a greater mortality, than when the disease occurs in solitary instances, or when it does not assume an epidemic prevalence: this may be owing to aërial or other causes having predisposed the constitution of susceptible or unprotected persons to severer attacks, and partly also to more concentrated states of the poisonous miasm conveyed by the air from the sick to the healthy. It is thus not uncommon to find persons who have been exposed to the infection of small-pox on ordinary occasions without being attacked, who nevertheless are seized by the disease in the severest form when it is epidemic.

97. 3d. Small-pox epidemics, like others, have a more or less gradual increase, and, when they reach their height, a gradual decrease. The rapidity of progress towards their height and their disappearance necessarily depend upon the population of districts where they break out, upon the numbers of susceptible persons, upon the communications, direct or indirect, between the sick and healthy, upon the observance of segregation, upon the rapidity with which the susceptible are infected, and upon the prevalence of the atmospheric, and other concurring influences to the formation of an epidemic constitution, either in a limited locality or in a more extended sphere.

98. 4th. Small-pox differs from other pestilences, inasmuch as that it may be propagated at all seasons of the year, and in very different atmospheric conditions, although with varying grades of rapidity and prevalence; whereas other infectious pestilences, as I have shown when treating of these, require certain ranges of temperature for their epidemic prevalence, or even for their contingent or possible communication. But small-pox, like scarlet fever and measles, although favoured more or less by temperature and season as these are, may prevail at any season in temperate countries, and more especially in the British Isles, yet the more general and most severe epidemics appear during warm seasons, or when a high temperature and much moisture in the air favour predisposition of constitution and the concentration of the poison. This compatibility of infection with any season and range of temperature incidental to temperate countries, accounts for the circumstance of small-pox, as well as scarlet fever and measles, being a domiciliated malady in these countries, although occurring after longer or shorter intervals in epidemic forms of prevalence and severity, as the numbers of unprotected persons become increased, or as the protection of vaccination wears out.

99. 5th. Epidemic small-pox may be local, owing to local circumstances and influences, as occurred in Norwich in 1819, when, between the months of May and October, about 530 persons died of the distemper within the limits of the bills of mortality, which do not include several parishes in the immediate neighbourhood, where it also prevailed. The limited occurrence of small-pox epidemics is often owing to the combination of morbid influences existing in the locality thus visited.

Norwich and other places, as Edinburgh, Glasgow, Lynn, Liverpool, &c., where such epidemics appeared, many, if not all the elements of an epidemic constitution already existed, and favoured the spread of the distemper either from isolated cases, or from an introduced infection or fomites.

100. 6th. Not only may persons be seized with small-pox, during its epidemic prevalence, who had previously escaped, although exposed to infection (§§ 95. *et seq.*), but also persons who have been vaccinated, and who, after long periods, have been revaccinated, and even inoculated with small-pox, without effect, may on such an occasion be attacked by variola. This was observed by Mr. Crosse in the Norwich epidemic of 1819, when the protective influence of vaccination may be presumed to have been greater than now, a shorter period having elapsed in most cases since the process was adopted. The small-pox thus following vaccination, after periods of different durations, but generally upwards of seven or eight years, although more or less modified, and commonly modified in proportion to the shortness of the period which had elapsed from vaccination, cannot be mistaken for any other eruptive disease, for, independently of the character of the eruption, inoculation with the matter from the vesicles of the modified malady has produced regular small-pox in the unprotected, as was shown by Mr. Crosse and others. It is chiefly during small-pox epidemics that the protective influence of vaccination is tested, and it is then that the amount and duration of this protection, in connection with proofs of an efficient and healthy vaccination, can be duly estimated. (*See art.* Vaccination.)

101. 7th. As I demonstrated with respect to scarlet fever, when epidemic, that that malady sometimes presented a most dangerous form, in which there was no eruption, and sometimes even no sore throat (*see* Scarlet Fever, §§ 26. *et seq.*), so it has been observed that an analogous form of small-pox occurs in some severe epidemics, especially in places where all the elements of epidemic severity concur to produce great malignancy. Thus it is recorded by Mr. Crosse, in his history of the Norwich epidemic of 1819, that a number of cases of fever with petechiæ, but without any variolous eruption, appeared in May, June, and July, when the epidemic was at the worst, and all terminated fatally. The victims were mostly children, enfeebled by scrofula, or some other disease; and as several were thus seized, whilst others in the same family were suffering from small-pox, and as no case of this kind occurred in any one who had previously gone through small-pox, Mr. Crosse ascribed (and, in my opinion, very justly) every case of it to the variolous infection.

102. 8th. Before the introduction of inoculation into Europe, and when variola appeared only in its natural form, the epidemics of it which occasionally appeared, especially when the numbers of the unprotected, by a previous attack, became greatly increased, were often most destructive and pestilential. The outbreaks of small-pox in London in former times frequently carried off several thousand persons in a few months. In 1720, upwards of 20,000 persons were said to have died of it in Paris; and Horstius states that the epidemic visitations of variola "aliquandò adeò sævæ et malignæ sunt, ut instar veræ et legitimæ trucis pestis in omnem ætatem et sexum grassentur et ferviraut cum multorum jacturâ et perditione;" and that, in 1614, it ravaged most of the countries of Europe more destructively than the plague, "in summâ nulli parcentes regioni, unius anni curriculo totam Europam seriatim visitârunt atque enormiter depopulârunt." It may readily be conceived that, when the distemper appeared in a district or city, after an absence of many years, when the greater number of the inhabitants were unprotected, its spread would be rapid and its ravages great. The mortality in the epidemics which occurred previously to the introduction of inoculation must have been very great, when we consider the efficient and concurrent elements of epidemic prevalence and fatality which every where existed in those times, and the nature of the treatment generally adopted. Even in recent times, the proportion of deaths to the number attacked by natural small-pox in several epidemic visitations of the distemper has varied from one in six to one in four.

103. 9th. *The possibility of persons being attacked by small-pox a second time* has been contended for by many, and doubted by others, as Mead, Heberden, Monro, De Haen, &c. De la Condamine estimated second attacks as one in ten thousand. Whilst admitting the possibility of a second attack, I doubt if its occurrence be even so frequent as here estimated. It is only when the disease is epidemic, and the exposure to the infectious miasm has been prolonged, or the poison has been concentrated in the respired air, that it may occur. Dr. Gregory states that very few persons ever present themselves at the Small-pox Hospital who have affirmed that they had previously undergone the disease; and of these few, but a very small fraction can stand the test of rigid scrutiny. In one of the last cases that occurred, the medical man who witnessed the first seizure had misgivings as to the true nature of the case. No instance is recorded of the same person having been admitted twice at the Small-pox Hospital. As to second attacks of variola, there are several sources of error. Sometimes the first attack is incorrectly reported, sometimes the second. The same medical man very rarely has seen both attacks. Chicken-pox is very frequently mistaken for variola, and even psora, ecthyma, and even pustular syphilis, have given origin to mistakes. The case of recurring variola which made the greatest noise was that of Louis XV., who died of small-pox in 1774, at the age of 64, after having, as it is alleged, undergone that disease casually in 1724, when 14 years of age. But the physicians who attended him in this first attack were not agreed as to its having been small-pox; and it was known that he was abroad and well six or seven days after the eruption was out, further evincing the non-variolous nature of the attack. I therefore agree with Dr. Gregory in believing that the primary disorder which his majesty had was varicella.

104. VIII. Of the Inoculation of Small-pox. — Inoculation having been abolished by Act of Parliament, and the end held in view having been more satisfactorily obtained, as generally supposed, by having recourse to vaccination, it may appear unnecessary to many to make inoculation of small-pox a topic of discussion at this time. Yet when all the evidence connected with

the comparative merits of inoculation and vaccination in temperate and warm climates, and in different races of the species, is duly considered, some notice of this still not unimportant topic should not be omitted. At the time of my writing this, just half a century has elapsed since the discovery and introduction of vaccination; and after a quarter of a century of most transcendental laudation of the measure, with merely occasional whisperings of doubt, and after another quarter of a century of reverberated encomiums from well-paid vaccination boards, raised with a view of overbearing the increasing murmurings of disbelief among those who observe and think for themselves, the middle of the 19th century finds the majority of the profession, in all latitudes and hemispheres, doubtful as to the preponderance of advantages, present and prospective, to be obtained either from inoculation or from vaccination. In 1823, I stated in the *London Medical Repository* (see the REFER., &c.), from evidence which had come before me in families which had suffered in numbers from small-pox, that the protection afforded by vaccination was impaired by years, and wore out in twelve or fourteen years, or in a longer or shorter time, according to diathesis, &c. — that vaccinated persons were liable to small-pox, in a more or less modified form, after some years, say nine or eleven; in a mild but distinct and fully developed form in from twelve to fifteen years, and to the usual states of the distemper, according to diathesis, to exposure to infection and epidemic prevalence, after this more advanced age. What was then predicted has since been so generally fulfilled, that revaccination has been adopted in many places, and has often failed, natural small-pox having notwithstanding appeared in the revaccinated, — both in those in whom the measure appeared to have succeeded, and in those in whom it failed.

105. Thus half a century has brought us to the position that we are doubtful which to prefer, — vaccination, with its present benefits and its future contingent dangers, or inoculation, with its possible present dangers and its future advantages. If there were no other considerations, but these which could be seriously raised in connection with the inoculation of variola, I should, for my own part, and after a due consideration of the subject in its various bearings, be at no loss which to select for those for whom I feel the interest connected with the nearest relationship; but there is the contingent and not improbable diffusion of the variolous poison to the unprotected by inoculation to be taken into account; and there is obedience also to the laws, which is the duty of every good citizen, and is strictly observed by every well-educated physician, although systematically disregarded and trespassed by pretenders and irregular medical practitioners. Another half century, the end of the 19th century, will, I fear, find the physician no longer in doubt as to which he will choose, even in this climate, as he no longer can be in doubt in India and other parts of the East, and as respects the dark races, unless he be influenced by authority and prejudice, — influences which are equally unworthy the high position in which his profession places him in the estimation of those whose opinions alone deserve respect and consideration.

106. *Inoculation of small-pox* is the artificial insertion, beneath the cuticle, or in a wound or puncture, or the application on an abraded surface, of a person not previously attacked by small-pox, of a minute portion of the virus formed in the vesicles or pustules of one labouring under the malady. By this mode of communicating the malady, the system is generally infected by the smallest quantity of the poison capable of producing this effect. In the East, inoculation has been practised successfully, and in a rational manner, from a remote period — as remote as the history of the disease carries us. The following arguments have been adduced in favour of it, and previously to the discovery of vaccination powerfully recommended it; and even now they should be calmly weighed against the advantages of vaccination, as far as these have been yet ascertained, and as they may be valued prospectively.

107. (*a.*) All persons not protected by an attack of small-pox are liable to be seized with this distemper at any period of life, in every circumstance in which they be placed, and on any occasion. It therefore behoves them to obtain this protection as early as may be consistent with a safe and efficient recourse to it. Now this protection was formerly inoculation; more recently, and at present, the only legal protection is vaccination. The former communicated a milder form of the same disease as a certain protection; the latter transmits an affection, of a slight and by no means dangerous nature in itself, which is somewhat similar in certain respects, and which has the virtue of preventing an attack of small-pox for some years, and of rendering such attack milder in grade, and modified in character, for an indefinite period; this protection, however, is not durable, but terminates after an indefinite number of years; in some instances entirely exhausting itself, and leaving those who may consider themselves protected open to either a mild and modified, or a confluent, severe, or even fatal attack of the malady.

108. (*b.*) The individual and collective evils resulting from the infection of natural small-pox, whether appearing in scattered or rare cases, or breaking out with pestilential prevalence, are well known. The history of small-pox epidemics, as observed in communities furnishing numbers of unprotected persons, sufficiently demonstrates the devastation which followed the entire want of any protecting power, before the introduction of inoculation into Europe. When this protection was introduced, its influence was manifest, not only in respect of the persons who had recourse to it, but also as regarded the community, in diminishing the frequency and fatality of epidemic small-pox, and in furnishing protected persons to attend upon the infected. Still there was a certain amount of evil connected with this mode of protection. The chance of communicating a dangerous or even fatal malady, and the contingent propagation, from the inoculated individual to the unprotected, of this disease, dismayed many, and furnished arguments in former times against having recourse to it. When weighed in connection with the fact, that some few entirely escape small-pox during their whole lives, although these were admitted to be very few, many were induced entirely to neglect this mode of protection, and, in more recent times, to adopt a

milder method, and one which appeared to the public and to the profession, until lately, equally efficacious and permanent.

109. The chief objections here urged against inoculation were partly specious and partly just. Inoculation practised by ignorant, unskilled, and unprofessional hands, in improper seasons, ages, and circumstances, or with a total disregard of the states of health of those subjected to it, may occasionally be followed by dangerous or even fatal results. Nevertheless it has been shown that, with all these drawbacks, and without the precautions, the science, and the care, which the educated physician can employ, the proportion of deaths amongst the inoculated does not rise above 5 in 1000. That inoculation would spread the distemper is certainly true when a few only resort to it; but even such diffusion would prevent the recurrence of those pestilential epidemics which follow the accumulations of a great number of unprotected in one locality, and would diffuse the disease in a milder form than when it occurs epidemically; for it has been fully proved that infection from the inoculated distemper generally does not communicate so severe or dangerous an attack as infection from a natural and epidemic case. Besides, if inoculation were generally adopted at a proper age, there could not possibly be the pabulum for an epidemic outbreak, and scarcely the occurrence of a natural case.

110. (*c.*) Against this admitted amount of unfavourable contingency, must be placed the firm confidence of protection, which inoculation furnished to all persons, in all climates, and to all races within the tropics, and to the dark varieties of the species. In these climates and races, vaccination (which the law has made to supersede inoculation) has been demonstrated to be inefficacious; but in all these circumstances, however diversified or opposite, inoculation has been found, and still is found, the most certain protection from the severer distemper and from epidemic outbreaks.*

111. (*d.*) Several *unfavourable contingencies have been urged against inoculation*; but certain of these need not be apprehended. That this measure may communicate a severe, a disfiguring, or even a fatal malady to a person who may entirely escape it if inoculation were not performed, must be admitted; but this argument was without weight before the introduction of vaccination, and now the advantages of the one mode of protection should only be weighed against the other with the view of adopting either of them, for the neglect of both is manifestly not merely improper but even criminal. It has been urged that inoculation may not only be followed by a dangerous attack, but that it may develope other maladies, especially severe affections of the eyes, terminating in blindness, and diseases of various organs; but these would more certainly follow the natural infection of small-pox, which, without either inoculation or vaccination, could very rarely be avoided. To these contingencies vaccination is certainly not liable; but it should not be overlooked that scrofula and tubercular formations are more frequently observed after vaccination than after inoculation (see *art.* SCROFULA, &c., §§ 48, 49.). The risk of a second attack after the inoculated small-pox has been urged; but this risk hardly exceeds a possibility, and should not be taken into account; the risk of being attacked after vaccination, or even after revaccination, being infinitely greater, especially during adult and advanced age. (See *art.* VACCINATION.)

112. (*e.*) It has been urged by Dr. BARON and others, who are the most determined supporters of vaccination, that "the practice of inoculation, the greatest improvement ever introduced in the treatment of small-pox, although beneficial to the person inoculated, has been detrimental to mankind in general. It has kept up a constant source of noxious infection, which has more than counterbalanced the advantages of individual security." (*Life of Jenner*, vol. i., p. 260.) This is true only to a certain extent; for if all were inoculated early in life (as by law might be enforced) there could be few or none liable to the natural infection and epidemic visitation of the malady; and according to the numbers unprotected would be the risk of such infection and visitation. Inoculation, although practised the most during the last half of the 18th century, was nevertheless as often neglected or put off, until it was too late to prevent the natural infection, and hence all reasoning respecting it became inconclusive, especially in local and other circumstances, respecting which the particulars were either imperfectly known or altogether unknown.

113. Sir G. BLANE has endeavoured to show that the proportion which the mortality by small-pox in London bore to the general mortality increased during the last century from 78 to 94 per thousand; and that the diffusion of small-pox by inoculation was more strongly exemplified in the country than in London; since there are many places where small-pox was not known for twenty, thirty, and even forty years, in which at present scarcely an adult can be found who has not had it. These arguments are, however, more specious than solid. For, as respects London, the increase of population, the diminished prevalence of all other diseases, and the prevalence of epidemic small-pox, are not duly estimated. From 1711 to 1740, when there was no inoculation, the deaths by small-pox were 65,383; from 1741 to 1770, when inoculation was coming into use, the deaths were 63,308; and from 1771 to 1800, when inoculation was the most frequent, the deaths were 57,268. The increase of population during these periods should not be overlooked. As to the escape of many places for many years, upon which Sir G. BLANE has laid so much stress, it should be known, that such places were always

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* Between December 1849 and April 1850 inclusive, 76 cases of small-pox were admitted into the General Hospital, Calcutta. Of these 29 died. Of the 76 admitted, 66 had been vaccinated. Of the 66 vaccinated, 41 had good cicatrices, and 25 had cicatrices not so well marked. Of the total 76 cases, 30 were severe and confluent, 46 mild or modified. Of the 10 unprotected cases, 5 were severe and confluent — of whom 4 died — and 5 were mild. Of the remaining 25 confluent cases, after vaccination, 12 had good cicatrices, and 13 cicatrices not so well marked. Of those that had been vaccinated in early life, 16 died, of whom half bore good scars, and half had scars not well marked. Of the whole number, 65 were males, 11 females; 8 were children aged five years or under, of whom 1 died. Six of these children had been vaccinated. The mortality here stated as occurring from variola after vaccination — 16 out of 66, or 24 per cent. — is the highest upon record in any country, and must be attributed either to the malignity of the prevailing epidemic, to the climate and locality, or to the influence of race, — probably in part to all these.

visited at last, and without exception, by most destructive epidemics, the great number of the unprotected furnishing an abundant papulum for their malignant and fatal prevalence. It becomes, therefore, much preferable to have, even in these places, the regular adoption of inoculation by qualified persons, with even the highest rate of mortality consequent upon this measure, than the immunity of many years, with a mortality of 25 or 30 per cent, as recorded of these epidemics.

114. There can be no doubt that early in, and about the middle of, the last century, when inoculation was adopted only by a few, and even afterwards, when inoculation was very irregularly practised, and when many, even the majority in many places, were left without that protection, that it multiplied the sources of infection; but this was merely a powerful argument then for universal inoculation, as it is now for the adoption either of vaccination or of inoculation, if the latter were allowed by the legislature. On this subject, as will more fully appear when vaccination comes under consideration, writers have been partisans, rather than calm examiners of facts, as formerly or at present observed, and as faithful expositors of what may rationally be expected.

115. *There are a few rules requisite to the safe conduct of inoculation* that ought to be observed: — 1st. This measure should be employed for persons in good health — in those who are neither debilitated, nor plethoric, nor obviously scrofulous. Debilitated persons should previously be restored to health, and the plethoric reduced by moderate evacuations and active exercise. All the secretions and excretions ought to be natural and free; and wherever a cachectic state of system, or indications of visceral congestion or obstruction exist, inoculation ought not to be performed. 2d. It may safely be practised at any age from three months and upwards, but it should not be resorted to during pregnancy and the puerperal states, on account of danger to the mother and child, nor during lactation. 3d. It may be practised at all seasons in temperate countries, and in all climates. The preferable season is that which is moderately cool, and admits of due ventilation of the patient's apartment. In warm climates, the coolest season of the year should be selected; and this season has always been selected by native inoculators in the warm climates of the East, where inoculation has been adopted from early ages. 4th. Inoculation is successful, compared with the natural distemper, in all races and climates, but more especially in the dark races, and in tropical countries; for, although the proportion of deaths after inoculation may be higher in the dark than in the white races, the protection furnished by it is even greater in the former than in the latter, natural small-pox being so remarkably destructive in all dark races.

116. That variolous inoculation by unqualified persons ought to be prevented by legislative enactment cannot be disputed; but there are circumstances which may render recourse to it, under due precautions, a justifiable measure, especially the following: — 1st. When small-pox unexpectedly breaks out in a district, at a time when vaccine virus is not to be obtained. 2d. When persons who have been vaccinated in infancy are about to proceed to inter-tropical climates, and are likely to visit places where small-pox either prevails or recurs epidemically. 3d. Among the dark races, when they will not adopt vaccination, or when the vaccine virus is inefficient, either as respects its local effects, or its protective power. 4th. When persons are insusceptible of vaccination, from peculiarity of constitution, or some other cause.

117. In the present state of our knowledge as to the protection furnished by vaccination — believing that this measure will never be generally adopted, and that, if it were so adopted, it could never altogether banish small-pox, nor prove a complete or lasting preventive of variolous infection — it becomes doubtful whether or no the amount of benefit conferred by vaccination will hereafter prove greater than would be furnished by the general adoption of inoculation: as respects inter-tropical climates and the dark races, the candid inquirer into the merits of both will ere long, even if not now, declare for the latter. As inoculation is still practised in some countries, as it is still in many climates preferred to vaccination, and as it is the measure to which the majority of persons above forty years of age owe their protection from the natural distemper, the more important particulars connected with its performance require to be stated; and I cannot do this better than nearly in the words of Dr. GREGORY: —

118. *Inoculated small-pox.* — Inoculation is performed by introducing into the arm, at the insertion of the deltoid muscle, by means of a lancet, a minute portion of variolous matter. The thin lymph of a fifth-day vesicle is to be preferred to the well-concocted purulent matter of the eighth day, but both are efficient. One incision only is to be made. A minute orange-coloured spot is perceptible on the second day, by aid of the microscope: on the third or fourth day, a sensation of pricking is felt in the part. The punctured point is hard, and a minute vesicle, whose centre is depressed, may be observed, surmounting an inflamed base. On the fifth day, the vesicle is well developed, and the areola commences. On the sixth day, the patient feels stiffness in the axilla, with pain. The inoculated part has become a hard and inflamed phlegmon; the subjacent cellular tissue having become involved in the inflammatory action. On the evening of the seventh, or early on the eighth day, rigours, headache, a fit of syncope, vomiting, an offensive state of the breath, alternate heats and chills, languor, lassitude, or, in the child, a convulsive paroxysm, announce the setting in of fever. The constitution sympathises with the progress of the local disorder, and the virus has affected the whole system.

119. On the appearance of febrile symptoms, the inflammation of the *inoculated part* of the arm spreads rapidly. An areola of irregular shape is soon completed, which displays within it minute confluent vesicles. On the tenth day, the arm is hard, tense, shining, and very red. The pustule discharges copiously, and ulceration has evidently penetrated the depth of the corion.

120. On the eighth day, spots of variolous *eruption* begin to show themselves in various, and often in the most distant parts of the body. In the majority of cases, the eruption is distinct and moderate. Two hundred vesicles are counted a

full crop. Sometimes not more than two or three papulæ can be discovered, which perhaps shrivel and dry up, without going through the regular process of maturation. In other cases, the eruption is full and semi-confluent, passing through all the stages to maturation, and scabbing, and cicatrisation, with as much perfection as the casual disease can display. Between these extremes every possible variety may be observed. The truly confluent eruption, with affection of the mucous surfaces, is very rare, and that implication of the fluids and of the nervous system, which together constitute the extreme of variolous malignity, is nearly, if not entirely, unknown. Secondary fever, therefore, is not common, at least in any intensity.

121. IX. TREATMENT. — Small-pox being a specific disease, of a determinate course as respects both the eruption and the febrile phenomena characterising it, is less amenable to treatment than most other acute diseases. Nevertheless rationally-devised means exert considerable influence on the course of the distemper. In many cases, little or no interference on the part of the physician may be required, but something is always expected from him when his aid is called in, and it should, therefore, be clearly known what measures may be injurious and what beneficial. In severe cases, however, medical aid is always more or less requisite and advantageous, but to be the latter it should be based upon sound pathological views, and upon an accurate recognition of existing morbid states. Dr. GREGORY justly remarks, that "it is a melancholy reflection, but too true, that for many hundred years the efforts of physicians were rather exerted to thwart nature, and to add to the malignancy of the disease, than to aid her in her efforts. Blisters, heating alexipharmics, large bleedings, opiates, ointments, masks and lotions to prevent pitting, were the great measures formerly pursued, not one of which can be recommended." We may smile at the red bed-hangings, the red blankets and counterpane, the mulberry wine, the juice of pomegranates, prescribed for the malady by JOHN OF GADDESDEN; "but if either he or GORDONIUS or GILBERTUS were to rise from their graves, and inquire whether this is one whit worse than mesmerism, or at all more absurd than homœopathy or hydropathy, we should, I fear, look a little foolish. Let us, then, avoid the errors of our ancestors, without reproaching them."

122. Even in more recent times, and down to the days of SYDENHAM, or even to those of VAN SWIETEN and HEBERDEN, physicians have entertained very erroneous notions as to the powers of medicine in small-pox, and as to the intentions by which they should be guided. They imagined that certain drugs possessed the power of promoting the eruption, and not only of promoting it, but of procuring a favourable sort — a power, however, which was much more frequently injurious than beneficial; and, as far as it was manifested, much less rational and serviceable than the means employed for ages in the East in the treatment of small-pox. In this disease, we remark, as in several others, that the boasted powers of doctrinal science, when not fully advanced, are often more prejudicial than beneficial, especially when blindly adopted, and applied without the guidance of rational observation.

123. The treatment of small-pox should be directed with similar *intentions* to those recommended for the management of other fevers. Means should be employed, 1st, to moderate febrile phenomena, whenever they are severe or excessive; 2d, to prevent or remove local determinations or congestions of blood, or other concomitant affections or structural changes; and, 3d, to support the powers of life, whenever they are inordinately depressed or exhausted, by the influence of the morbid poison on the nervous and circulating systems. These *indications* should never be overlooked in any form, stage, or state of the malady. In the mild or distinct form, the active adoption of them may not be required; yet even in it, the occasions which may demand their due observance should carefully be watched for, and promptly met when observed.

124. *A. The primary or initiatory fever* may not be recognised as that of small-pox in cases occurring independently of inoculation, or without obvious sources of infection, and in these the treatment of this stage must be conducted according to the principles developed under the treatment of continued fever (see *art.* FEVER, §§ 126. *et seq.*). If, however, it be known, or strongly suspected, that the incipient disease is small-pox, the question arises, shall there be any difference in the treatment to be adopted from that usually employed in continued fever? But, as it is in continued fever, so it is in small-pox, the febrile action, the type and character of the fever, may vary from inflammatory to adynamic, or even putro-adynamic, and display in the latter, as I have shown in respect of the former, not merely either extreme of type, but every intermediate phase. The treatment of this period, therefore, must necessarily depend upon the states of the pulse and of the general phenomena, in connection with existing evidence of vital power; and upon the acumen and capability of the physician in recognising with precision these various and varying states, and in controlling or guiding them to a successful issue. As remarked by SYDENHAM, the fate of the patient depends upon the treatment of this stage, — that is, of the first three days of the disease.

125. The patient should be removed to a large and airy chamber, which ought to be darkened and well ventilated. He should be laid on a hair mattress, and be covered by a moderate quantity of bed-clothes, his head resting on a hair pillow, as being more cool than that in common use. The temperature of the room should be, according to the amount of febrile heat, from 55° to 65°, but preferably from 55° to 60°. If the disease be distinct, and the febrile symptoms not very severe, the patient may not be confined to bed during the day, his clothing being appropriate to the circumstances in which he is placed. A dose of calomel with James's powder, or antimonial powder, should be given, and be followed, three hours afterwards, by a purgative pill or draught. After these, saline draughts in a state of effervescence may be prescribed from time to time, and the bowels preserved in a moderately open state by the usual cooling aperients. In the slighter forms of the disease, no further medicine will be required; the beverages, diet, and regimen of the patient being regulated as stated hereafter.

126. If the primary fever assume a more severe

and inflammatory character, and if the pain in the head, epigastrium, and loins, be too severe to be allayed by the above means, and more especially if the patient be robust or plethoric, blood should be taken from the arm, in such quantity as the peculiarities of the case may warrant, in addition to these means. When the brain, lungs, or liver is congested, or the pulse full, hard, oppressed, or sharp, a moderate bloodletting, relatively to the state of the patient, ought to be prescribed; and this measure will be still more requisite when the headache is intense, the face flushed, and the vessels throbbing, the irritability of stomach extreme, the breathing oppressed, and the pulse full and labouring. When the eyes are suffused, and headache is experienced, leeches applied to the temples, or behind the ears, may be sufficient; or, in the more phlogistic cases, they may be employed in aid of bleeding from the arm, and be followed by calomel, James's powder, a purgative draught or pill, and cooling draughts. Dr. Gregory remarks, that "it has often been said that bloodletting, in the fever of invasion, interrupts the process of nature, repels the eruption, or so retards it, and so weakens the constitution, that the due concoction of the pustules is never effected. It is undeniable that a man may be bled unnecessarily and too largely in small-pox, but a moderate bleeding does no harm, and, if the fever runs high, often does great good." The propriety of having recourse to venesection, especially in the circumstances just mentioned, has been insisted on by Sydenham, Biendisant, Torrini, Dover, Berger, Stubbes, Falconet, and many others. De Valdes recommended bloodletting nearly a century before Sydenham; and Hecquet advised bloodletting from the feet at this stage. Hufeland very properly directed leeches to be applied to the temples when the disease was attended by convulsions. The quantity of blood to be drawn should depend upon the state of the pulse and other peculiarities of the case, always keeping in recollection the character of the prevailing epidemic and of physical influences.

127. *a. Emetics* have been advised by some writers on the invasion of the primary form of small-pox, and condemned by others. The propriety of having recourse to them depends upon the peculiarities of the case, the character of the epidemic and the season in which the distemper occurs. Sydenham prescribed an emetic, after bloodletting, in the primary fever, and in the secondary fever with internal complication. He likewise had recourse to it as soon as the disease appeared to be confluent. But there appears to have been much vacillation in his opinions as to both emetics and bloodletting in small-pox at different epochs of his practice, or rather during the different epidemic prevalences of the malady, as shown by his brief accounts of several epidemics; and I cannot depend so firmly upon the opinions of a physician, as many are disposed to do, who did not perceive, or duly estimate, the contagious and infectious nature of the malady. That emetics are often of service, especially at the commencement of the primary fever, and when indications of biliary obstruction, congestion, or accumulations are present, and during autumn or summer, I cannot doubt; but it requires close observation and experience to determine with precision the exact circumstances and period of the malady requiring their exhibition. They have been recommended by Dedekind, Hecquet, Leake, and many others, but in a too empirical manner, and with little regard to either the peculiarities of the case, the stage of the malady, or the choice of the agent. A writer in the Berlin Medical Transactions advises repeated emetics in this disease. The effects of one, however, will show the propriety of having recourse to it, and likewise of repeating it. In the low, adynamic, or confluent states of the disease, more especially, the choice of the agent is of some importance; for in these states, the more nauseating or depressing emetics, as tartar emetic or ipecacuanha, are not so appropriate as in the sthenic forms of the malady, unless they be conjoined with stimulants, aromatics, &c. In the former states the sulphate of zinc should be preferred. Some writers suppose that emetics diminish, others that they increase, the quantity of eruption; but it may be said of emetics, as of bloodletting, that they have little or no effect upon the eruption, or in lessening confluence. Their influence is exerted chiefly in promoting the excreting functions, whilst bloodletting diminishes inordinate vascular action, and relieves internal oppression and congestion.

128. *b. Purgatives* are generally beneficial during the primary fever, and very often also in the secondary fever; but they are required more especially when the secretions and excretions have not been duly evacuated previously to treatment, when the indications of local determinations, particularly to the head, are manifest, and when sthenic febrile excitement is considerable. In these circumstances, not only purgatives, but the whole of the *antiphlogistic regimen*, as insisted on by Sydenham, Hoffmann, Van Swieten, Bartholinus, Dimsdale, Currie, Eyerel, Beddoes, Perkins, &c., are beneficial. Much, however, depends upon the selection and combination of these means appropriately to the peculiarities of the case. In the primary fever, *calomel* is generally most serviceable, especially when conjoined with antimonials in the more sthenic forms of the disease, and with camphor in the more asthenic; but in most cases, a full dose of the calomel should be followed by a purgative draught in a few hours, if it have not operated sufficiently. Dr. Fowler supposed that, when calomel was given early in the eruptive fever, it diminished the quantity of eruption. But it cannot have this effect, unless it be taken before the first indications of eruption exist, and then its influence must be necessarily doubtful.

129. Osiander very justly cautions against too much purging; for it may develope an intestinal complication, in the form of either diarrhœa or dysentery, and thereby greatly endanger the patient. In the more inflammatory or sthenic cases, the phosphate of soda, the citrate of magnesia, or other cooling saline purgatives, should be preferred, or such as may be compatible with the use of saline diaphoretics, as the liquor ammoniæ acetatis and spiritus ætheris nitrici; but in asthenic or confluent states of the disease, after a dose of calomel or camphor, I have preferred to give the spiritus terebinthinæ, with about an equal part of castor oil, on the surface of a suitable vehicle, in quantity sufficient to act moderately on the bowels. If this dose be rejected, the

effect will, notwithstanding, be more or less beneficial, and after some hours it should be repeated, or the same substances in larger doses should be administered in an enema, which may be repeated according to circumstances.

130. During the primary fever, pain at the epigastrium is often considerable, or even urgent, and is frequently accompanied with irritability of stomach, and the rejection of whatever is swallowed. It may be requisite, from the severity of these symptoms, to endeavour to abate them. This object will be most readily attained by giving a full dose of calomel with a moderate dose of camphor and opium, and a little cinnamon or ginger, in the form of bolus, or in that of powder mixed in a little treacle. In these circumstances, saline effervescing draughts, with or without tincture of opium, generally fail of giving relief. If the disease presenting these symptoms is of an asthenic or confluent kind, as commonly observed, or if the medicine now recommended is not sufficiently efficacious, a mustard poultice may be applied over the epigastrium, or a mustard pediluvium or semicupium may be employed. In most cases I have preferred, to the mustard poultice, the application over the epigastrium of equal parts of the compound camphor liniment and of the turpentine liniment, with a little cajuput oil, and sometimes with a little olive or almond oil, on the surface of flannel or spongio-piline.

131. *c. Cooling diaphoretics*, especially small or moderate doses of the solution of the acetate of ammonia, or of the citrate of ammonia, or of the citrate of magnesia, or of the citrate of soda or potass, with the spirit of nitric ether, according to the states of the surface and of the bowels, will generally be of service; and the acid may be somewhat in excess when vascular action is inordinate. Cold sponging the surface, during the early part of the primary fever, or even the cold affusion, may be resorted to, as advised by BARTHOLIN, CURRIE, BEDDOES, JACKSON, and others; but when the eruption appears, these should be relinquished, for I believe that the recommendation of SCHAEFFER, SWAINSON, HUFELAND, WATSON and SELLE not to employ these means at this period is altogether judicious. MARCARD considered, and with much reason, that the tepid bath, previously to the appearance of the eruption, moderated the primary fever; and he recommended warm stimulating baths in the low and retrocedent states of the distemper. Many of the writers already named cautioned against carrying the cooling regimen too far, or employing excessive cold, in the treatment of low, confluent, or epidemic states of the disease, justly contending that a moderately cool or fresh state of the air, and a judicious recourse to restoratives or tonics were altogether indispensable in many cases, and especially in the epidemic prevalences of the malady. The treatment which appears the most appropriate to these cases will be hereafter stated (§§ 143. *et seq.*).

132. Dr. GREGORY justly remarks, that "if the circulation at this period (the primary fever) be languid; if the pulse be small and feeble, the skin pale, and the extremities cold; if the patient lies on his back, sunk and exhausted, let him have immediately warm brandy and water, cover him with bed-clothes, apply mustard poultices to the centre and extremities of the circulating system, and give thirty drops of laudanum, to be repeated in four hours if necessary. This cordial plan of treatment must often be continued for several days, when the eruptive nisus is accompanied with depression, and nature appears so obviously unequal to the effort." (*Op. cit.*, p. 100.) In these circumstances, the opium should be given with camphor or ammonia, or both; and the hot terebinthinate epithem will generally be more efficacious than the mustard poultices.

133. *B.* During the progress of the eruption, and in the *remission of the fever* which produced it, but little beyond a suitable regimen is required. A too officious recourse to medicine is oftener prejudicial than the contrary. The same remark applies to the secondary fever, or suppurative stage, when the disease is discrete and there is no complication. During the period of eruption and development, however, the secretions and excretions should be carefully watched and cautiously promoted, without producing irritation; and the senses and mind ought to be guarded against excitement, very light and bland beverages, and mild, weak, farinaceous nourishment, in small quantity only, being allowed. Dr. GREGORY'S remarks as to the treatment of this stage are so judicious, that I shall adduce them at this place.

134. "While the pustules are in process of maturation, a variety of measures may be pursued, which, without interrupting the salutary and necessary process of pustulation, lessen the patient's sufferings, and prevent subsequent difficulties. If the eruption proceeds favourably, you would not do more than lessen thirst by saline draughts, and occasionally relieve the bowels by a dose of castor oil. If the maturation of a large crop of pustules excites much fever, it will be prudent to employ more active purgatives, such as calomel with colocynth, the compound powder of jalap, or the infusion of senna with salts, all which cause a drain from the blood-vessels and lower arterial action. Place the patient in a large and cool room, and cover him lightly with bed-clothes. Remove all flannel coverings which may usually be worn next the skin. If the surface be very tender, apply to it some cooling lotion, such as the decoction of bran with some spirit of rosemary. In all cases, even of moderate intensity, it is proper to cut the hair close, and so to maintain it during the whole course of the disease. The head is thus kept cool; delirium is relieved or prevented; the risk of cellular inflammation of the scalp diminished, cleanliness enforced, and an opportunity afforded for the employment of evaporating lotions, should more urgent symptoms arise. Opiates may be occasionally administered at bed-time, when there is much cuticular irritation, or great distress from want of sleep.

135. "The diet of the patient should consist of tea, bread and milk, arrowroot, rice-milk, and roasted apples. Grapes, oranges, and ripe subacid fruits are grateful to the patient, and useful adjuvants to the antiphlogistic remedies. Lemonade, apple-water, tamarind-water, toast-water, and milk-and-water, must be the ordinary beverages. SYDENHAM permitted his patients to drink small-beer — an indulgence which may still be granted. To that able physician we are indebted for this, the cooling system of treatment in small-pox.

136. "One of the first objects, which, in cases of more urgency, will attract your attention, is the condition of the throat. Gargles of infusum

rosæ comp. afford some relief. When the difficulty of swallowing is very great, and the tonsils much swollen, leeches applied to the throat, followed by poppy-water fomentations, are serviceable. Under these circumstances, some physicians counsel you to apply to the throat, by means of a camel-hair pencil, a strong solution of lunar caustic (twelve grains to the ounce), with the view of checking the advance of the mucous vesicles. I have not adopted this practice, from a conviction that it would not affect the tracheal inflammation, from which alone danger is to be apprehended." (*Op. cit.*, p. 101.) More recently, much stronger solutions of nitrate of silver — from forty to sixty grains to an ounce of distilled water — have been applied to the pharynx, inside of the glottis, and even within the larynx and upper part of the trachea, by means of a sponge attached to whalebone; and, it is said, with success in some cases. Chlorinated lotions and gargles are generally of use when the affection of the throat and nasal passages is severe in confluent small-pox.

137. *C.* During the *secondary fever*, when it is severe or complicated, the treatment should be active but discriminating. The use of *purgatives* at this period was once a question of warm discussion. Dr. GREGORY remarks as follows:— "One of the most remarkable disputes which ever arose in physic was that regarding the propriety of using purgatives during the secondary fever of small-pox. SYDENHAM, with all his boldness, never wholly divested himself of the early prejudices which the Arabians had inculcated against purgatives in small-pox. MORTON inveighed bitterly against their use, while Dr. FRIEND, with the true spirit of a reformer, advocated their free employment, especially during the secondary fever." "They are now as freely employed in the secondary fever of small-pox as in ague or in typhus. They are of the greatest service when the skin is hot and dry, when a scarlatinal rash covers the body, or innumerable abscesses give evidence of the excited state of the cutaneous vessels."

138. Agreeing with the foregoing remarks, I would add only that, when too strong, or too frequently exhibited, purgatives may induce a dangerous diarrhœa or dysentery, or an enteric complication, especially if the selection of the means be not sufficiently discriminating in respect of the peculiarities of the case. As long as the disease manifests but little exhaustion of vital power, this care may be of less importance; but when vascular action is asthenic, and constitutional power is depressed, then such aperients as promote excretion, and, at the same time, impart tone or energy, should be preferred. Such are the means advised above (§§ 128, 129.), and such also are the compound decoction of aloes, or the compound infusions of gentian and senna, given in conjunction with the carbonates of the alkalies and aromatic tinctures, or with the citrate of magnesia, or with the carbonate or citrate of ammonia. In many cases, it may be requisite to aid the operation of these by means of enemata containing the substances already mentioned, with such others as the exigencies of the case will suggest.

139. The propriety of *bloodletting* in the secondary fever has been denied by most writers, and contended for by others, but by these latter under certain circumstances only. SYDENHAM, when he first wrote on small-pox, advised bloodletting in the secondary fever of the confluent disease alternately with purging; but at later periods of his practice, and when describing the epidemics of 1670 and subsequent years, which were manifestly of a most malignant character, the treatment recommended by him was of a very different kind (§§ 147, 149.) from that formerly directed. It would seem that the small-pox previously to 1665 and 1666, that is, before the great plague, was of a more sthenic nature than subsequently; and that, after this most fatal epidemic, by which about 100,000 bodies were buried in a few months within and immediately around London, thus furnishing additional sources of contamination to both air and water for many years afterwards, small-pox and other febrile diseases presented a more malignant character, and required different means of cure from those formerly employed.

140. When the pulse presents more or less tone, and vascular action is high, in connection with internal complication — congestive or inflammatory — then bloodletting, cautiously and moderately employed, according to the peculiarities of the case, and aided by such means as may derive the fluids from the seat of complication, and promote excretion, &c., will prove of much service. But if the pulse be weak, very quick, compressible, or small and soft, and, more especially, if there appear any signs of putro-adynamia or malignancy, as respects either the state of the eruption or the constitutional symptoms, decided means of an opposite kind are obviously indicated (§§ 143. *et seq.*).

141. In the secondary fever, when uncomplicated with any *internal affection*, or *contamination* of the circulating fluids, little beyond the preservation of a free state of the secretions and excretions need be attempted; aided, however, by a suitable regimen. In cases presenting prominent affection either of the brain or its membranes, or of the lungs, pleura, &c., general or local bloodletting, or both, according to the peculiarities of each case, is generally requisite; and purgatives and derivatives are further required. The state of the surface may appear to contra-indicate a recourse to blisters; but when the pustules on the trunk, or in the situation where it is desirable to apply a blister, are few, then they may be applied; and in these circumstances, as well as in others in which they should not be resorted to, the terebinthinate embrocations or epithems, often recommended in this work, may be employed without regard to the state of pustulation in the situation, to which it may be desirable to make these applications. The treatment recommended in the complications of continued fevers (*see art.* FEVER, §§ 529. *et seq.*) is generally suitable to those which occur in the course of small-pox; existing pathological states furnishing the only true therapeutical indications in all forms of fever, whether simply continued, or exanthematous, or malignant.

142. Ophthalmia is one of the most common of the concomitant affections in small-pox. In many cases of this complication, the state of the system will not admit of general or copious bloodletting; but in these, as well as in most other severe cases, scarification of the conjunctiva, leeches or cupping-glasses on the temples, warm fomentations,

calomel, purgatives, terebinthinate medicines given by the mouth and in enemata, are required, and should be mainly depended on, in connection with such other internal, constitutional, or febrifuge means as the character and state of the febrile symptoms will suggest.

143. *D. In the confluent states of variola*, or even when the pustulation is profuse and general, the treatment should be such, from the commencement, as will not reduce the powers of life; and even before the eruption appears, and when the character of the primary fever, and the severity of the vomiting and pain in the back and loins, and the stinging heat of the surface, indicate a severe or confluent form of the disease, it may be necessary, especially if the pulse be very rapid, or deficient in tone, or broad, open, and very compressible, to have recourse to the more tonic of the several febrifuge medicines usually employed. In these cases, as well as in others presenting signs of putro-adynamia, as petechiæ, hæmorrhage from mucous canals, a dark brown or black appearance of the eruption, whether at an early stage, or during the maturation and secondary fever, the preparations of *cinchona*, either with the mineral acids or with the alkalies, according to the features of individual cases, are generally required.

144. Cinchona was prescribed in these states of the disease, in various forms of preparation and combination, and was administered in enemata by Gesner, Fouquet, Bayley, Hirzel, Wall, Baldinger, and others; and they relied upon it chiefly in the secondary fever, when accompanied with sinking of the powers of life, or with putro-adynamia. Hufeland advised the preparations of cinchona to be given with antimonial wine; but this combination is admissible only at an early stage of confluent or malignant cases, and is not suited to the more advanced stages, or when hæmorrhagic exudations are observed. In these latter circumstances, I have found the decoction of bark to be most beneficial when conjoined with the hydrochloric acid and the hydrochloric ether, or with the chlorate or the nitrate of potash and tincture of serpentaria, or with the nitric acid and spirit of nitric ether. The sulphuric acid was advised, in the form and states of the disease now being considered, by Sydenham, Brocklesby, Waldsmidt, Nowach, and others, conjoined with various stimulants. More recent writers have conjoined the decoction or infusion of cinchona with the sulphuric acid, and the spirits of sulphuric ether, for these and similar states of the distemper; and still more recent authors have employed the sulphate of quina in these or similar forms of combination. These means are severally of more or less service; and it may be even necessary to combine them still further, as with the tincture of opium, or with the compound tincture of camphor.

145. The nitric acid was recommended by Dr. Scott for the more adynamic and confluent states of the malady; the hydrochloric acid by Jahn, and the acetic acid with camphor by Marx, Thomann, Plinta, and Hopp. Either of these acids, or of those above mentioned (§§ 143, 144,), or the citric acid, is more or less beneficial when suitably conjoined with tonics, cordials, or stimulants, according to the peculiarities of the case; and in these combinations they have been prescribed by Falconet, Rush, Thuessinck, Lafontaine, and others. Of the good effects of the acetic or the citric acid, conjoined with camphor, or with ammonia, this latter being in excess, and given with the infusion or decoction of cinchona, and aided, in the more severe cases, by wine, beef-tea, &c., I can speak from experience.

146. E. In the *petechial form* of small-pox, treatment will generally prove inefficacious. Dr. Gregory thinks that it admits of no essential relief from medicine. He considers purgatives to be inadmissible, and mercury without influence. The loss of a little blood from the arm has appeared to him more effectual than any other measure. "The citrate of ammonia in effervescence, with port wine or brandy, may be given when the powers of life appear to fail, but the hæmorrhagic diathesis is often accompanied by a hot skin and an excited circulation." (*Op. cit.*, p. 104.) When the skin is hot and the circulation excited, in connection with petechiæ, or spots of purpura, or with hæmorrhage from mucous canals, the abstraction of a little blood from the arm may prove beneficial; but these symptoms should not prevent a recourse to the means just recommended (§§ 143. *et seq.*); for they often subside after a decided recourse to these means, especially when the medicines are directed to the prevention or counteraction of the contamination of the blood, and the defect of vital power, upon which they depend. When the prostration is not great, nor the hæmorrhage very considerable, nor the eruption of a dark or malignant hue, then recovery may follow a recourse to cinchona, conjoined with the chlorate or nitrate of potash, and with the carbonate of soda and cordial or stimulant tinctures; camphor, or small doses of turpentine, being given occasionally in the intervals between the exhibition of these. Instead of cinchona, the preparations of valerian may be employed. I have generally preferred them when delirium was present. If the bowels are affected, the preparations of opium, or the compound tincture of camphor, should be added to these; and if the evacuations are very offensive, as well as too frequent, pure charcoal-powder, or the chlorides in small but frequent doses, may be prescribed. When, with these putro-adynamic symptoms, the liver is inactive or congested, then the nitro-hydrochloric acids may be prescribed in the decoction or infusion of cinchona, or the infusion of valerian; and when cerebral symptoms predominate, or when low delirium, tremor, and nervous exhaustion prevail, then the tincture of *sumbul*, lately introduced into practice by Mr. Savory, will be found of great service.

147. In cases presenting more or less contamination of the circulation and adynamia, as those now considered usually present, small and repeated doses of *opium*, especially when conjoined with camphor, or the chlorides, or the nitro-hydrochloric acids, or with cinchona, or valerian, or sumbul, will generally be most serviceable. When the bowels are most relaxed, in such cases the preparations of opium are more especially required; and they may be given with milk and lime-water, or with aërated lime-water. In the circumstances just named, and more especially in the secondary fever attended by marked putro-adynamia or malignancy, Wandt and Stroem prescribed opium with the sulphate of alumina. Dr. Drummond recommended the preparations of opium, in large doses, from the com-

mencement of the eruption in confluent cases; Tralles, Gebel and Young adopted a similar treatment. P. Frank considered these preparations to be deserving of our chief reliance in these cases; and the same opinion was entertained by Huxham, De Haen, Hufeland, Sprengel, Stoerck, and others. Sydenham considered them of greatest service when exhibited on the fourth day of the eruption in adults, and given in the evening or towards night. He trusted to them especially in the confluent form, and about the eleventh day, or most dangerous period of the disease. Thomann prescribed opiates in severe cases, after the exhibition of an emetic; and Quentin combined them with the oxide of zinc. The preparations of opium, with the exception of the weak paregoric of the pharmacopœia, cannot be given, without the risk of producing severe cerebral symptoms, in children under the age of four or five years; and even at that age, these symptoms may occur, if they be not guarded against by resorting to cold-sponging over the scalp, and by cooling aperients. In cases which most require opium, camphor, or ammonia, or the usual aromatics or stimulants, are also beneficial, and both promote the good effects, and counteract the injurious influence, of this substance. The excellent effects of the laudanum prescribed by Sydenham depended upon the combination of aromatics in its preparation — a combination which has been very imperfectly estimated, even by his warmest admirers.

148. *F.* The *laryngeal* and *tracheal affection*, arising in the course of severe variola, is generally an extension of the specific inflammation existing in the mouth and throat, and is seldom much ameliorated by the means already noticed (§§ 143—147.). After having had recourse to these, emetics, especially the sulphate of zinc, or ipecacuanha conjoined with camphor, or ammonia, or capsicum, may be tried; for these have a more decided effect upon the respiratory surfaces than is generally recognised, especially in removing the viscid mucus from the trachea and large bronchi that generally collects in large quantity in these situations when the severe forms of small-pox are thus complicated. In these complications, the decoction of senega, or the preparations of squill, or of ammoniacum, conjoined with camphor, or ammonia, or other substances which the circumstances of the case will suggest, may be prescribed; and if these expectorants should act as emetics, as they will generally act when given in large doses, the effect will be the more beneficial, especially in confluent, or severe, or malignant cases.

149. *G.* The occurrence of *diarrhœa* or of *dysenteric symptoms*, especially in connection with the secondary fever and in confluent cases, requires means which should partly depend upon the appearance of the evacuations. In most cases, the medicines already mentioned (§§ 146. *et seq.*), ipecacuanha with camphor and opium, or with powdered carbon and the compound chalk-powder; and the other medicines usually given for diarrhœa or dysentery, may be severally prescribed in these complications of small-pox. Sydenham gave boiled milk with lime-water in these cases, or with ammonia or magnesia when the stools evinced a somewhat sourish odour; and Royer and many others adopted a similar practice. But when this complication appears in malignant, or even in the more usual confluent cases, more active astringents are required, and these should be associated with antiseptics, and absorbents, and opiates.

150. *H.* The state of the *urinary secretion* should receive due attention from an early period of the disease. The urine is often not only small in quantity, but also voided at long intervals in some instances; and it is occasionally remarkably high-coloured, and even contains albumen, and not infrequently blood, especially in the confluent and malignant cases. In the early stages of the more phlogistic cases, especially when the urine is scanty and very high-coloured, demulcents and diluents should be freely given, with the cooling diaphoretics already mentioned (§ 131.), and with diuretics of a cooling and febrifuge kind, as recommended by Thomann, Lentin, and others. When the urine contains albumen, or blood, globules, or even pure blood, then the terebinthinate embrocation or epithem may be applied over the loins, and repeated according to its effects.

151. *I. Small-pox in puerperal females*, especially when it occurs very soon after delivery, is always a most dangerous disease. Not only is it generally confluent, and attended by marked asthenia, but it is also complicated with very severe, and usually fatal, affection of the respiratory mucous surface, extending to both lungs. Of several cases of variola to which I have been called in the puerperal state, I have seen only one which was mild and uncomplicated. The treatment in these unfavourable circumstances should partly depend upon the time which has elapsed between delivery and the appearance of the distemper, partly upon the amount of hæmorrhage which has taken place at the period of delivery or subsequently, and upon the states of the lochia and of the lacteal secretion. When the discharges have been and are free, and the pulse is very frequent and soft, the severity of the laryngeal, bronchial, or pulmonary complication, or indeed of any other associated affection, should not prevent recourse to the means already recommended for the severe, confluent, and adynamic states of the malady (§§ 143. *et seq.*), especially to camphor, ammonia, wine, or other stimulants and tonics; or to such as are advised for the malignant form of *puerperal fever* (see that article). When the respiratory passages are very severely implicated, the remedies already mentioned, especially senega, squills, ammoniacum, sulphate of zinc, &c., prescribed as expectorants or as emetics, according to the emergency of the case, ought not then to be overlooked. The great severity and unfavourable prognosis of small-pox in the puerperal state should not prevent a decided recourse to the most active means in the treatment of this class of cases, but, on the contrary, should induce us to employ the most energetic medicines in the most prompt and appropriate manner.

152. ii. EXTERNAL MEANS HAVE BEEN USED TO GIVE RELIEF AND PREVENT PITTING, but they do not always succeed as respects the former intention, and they often fail as regards the latter. When pustulation is profuse, Dr. Gregory advises the surface to be liberally covered with some simple dry powder. Starch-powder, hair-powder, and powdered calamine are alike available for this purpose; cold cream, and mild unguents,

such as the unguent. cetacei, with a proportion of oxide of bismuth, are useful when there is much cutaneous irritation with a dry surface. "Fomentations and poultices are the only means of treating those abscesses and erythematous inflammations which so harass the patient, and so fearfully peril life in the later periods of secondary fever. All the attempts made by the use of masks to prevent pitting end in disappointment. The only effectual means of lessening such disfigurement are those which allay cutaneous action. Purgative medicines, low diet, and free exposure of the face to a cool air, are the sole measures on which reliance should be placed." (*Op. cit.*, p. 108.)

153. Whilst these means ought to be adopted, others may also be tried. Fresh air should be duly admitted; but, at the same time, light ought to be excluded as completely as possible. I believe, from what I have observed in several cases, that complete darkness prevents pitting, and that light increases the suppurative action in the pustules, and thereby occasions deep and permanent marks. Whilst the patient should breathe a freely-renewed air, the vesicles should be protected from the action which the oxygen of the air exerts upon them; and this may be done by various means, either by causing the vesicles to discharge their contents before suppuration commences, and by favouring the drying of their contents upon their surfaces, the scabs thus forming a natural protection from the action of the air; or by covering the vesicles with some substance, which may lessen the suppurative process, by protecting them from the air, and by lowering inflammatory action in the cutaneous surface.

154. The Arabians opened the pustules as fast as they ripened by a gold needle; and the moderns have applied lunar caustic to the pustules, so as to destroy them at an early period of their development. As to this latter practice, Dr. Gregory remarks that, as a partial application — say to vesicles forming near the eye — he can recommend this measure; but that he cannot advise it to be employed to any large surface covered with confluent or semi-confluent vesicles. He adds, "The latest mode of treating the surface during the maturative stage of small-pox, is that of applying mercurial plasters, containing calomel, or corrosive muriate of mercury, or covering the whole surface with mercurial ointment. In the French hospitals at the present time, the latter mode is in fashion. The reports of its success are not, however, very flattering. I have seen all three plans fairly tried at the Small-pox Hospital. The ointment and calomel plasters were inefficient. The plaster of corrosive sublimate converted a mass of confluent vesicles into one painful and extensive blister; but I am still to learn what benefit the patient derived from the change." (*Op. cit.*, p. 103.)

155. Other means have been used for the prevention of pitting, either by causing the abortion of the pustules in the course of their development, or by drying them up after they have maturated. Dr. Bulkley remarks, that, as a general rule, the more recent the eruption, the more easily it is arrested. One writer thinks that the pustules can be arrested, even after their suppuration, and another fixes the period at which this can be done as late as the seventh day. In 1825, I tried the effect of complete exclusion of light in preventing pitting, and in that case it was altogether successful. I have since had recourse to it in three or four cases with success; in one confluent case it failed. I have, in three other cases, covered the surface of the face with almond or olive oil, and excluded light, keeping the apartment freely ventilated; these have not been marked; the eruption was very copious, but not confluent in any of these. Instead of almond or olive oil, glycerine, or collodion, as suggested by Dr. Ranking, may be employed.

156. Incising or opening the pustules, or rather the vesicles, as recommended by the Arabians, was the method of causing their abortion advised by Roggert, Voigt, Tournay, and Hufeland. M. Velpeau and Dr. Morton assert, that if the pustules are cauterised within two or three days, or even later, no marks will be left. The latter says that, if the face be frequently wetted with spirits of hartshorn, the inflammation will be abated, and the pustules will be prevented from becoming either large or irritable. M. Piorry recommends blisters to cause abortion of the pustules, but I consider their use not required in discrete cases, and of very equivocal benefit in the more severe states of the distemper. M. Malapert prescribes a solution of hydrate of potassa, which, he says, dries up the pustules, without leaving either cicatrices or stains. The strength of the solution is not stated.

157. Many years ago, Digby directed the face to be covered with *gold-leaf*. Larrey advised the same means, and stated that this method of preventing pitting by small-pox was employed from time immemorial by the Egyptians and Arabians. It can act only by excluding light and air from the diseased surface. Drs. Crawford and S. Jackson, of the United States, say that they have found the *tincture of iodine* to succeed in preventing the marks of variolous pustules; and various kinds of ointment and plaster have been also confidently recommended with this intention.

158. *Sulphuric ointment*, rubbed lightly, three times a day, over the parts affected, has been recommended for the prevention of suppuration in the pustules and the consequent pitting (*Gaz. Méd. de Paris*, Avril, 1841, p. 232.). The emplastrum plumbi, melted with oil of almonds, and laid over the face by a camel's-hair pencil, has been prescribed by Dr. Corrigan (*Dublin Quarterly Journ. of Med. Science*, Aug. 1846, p. 245.). A mask, composed of mercurial *ointment*, rendered more consistent by means of starch or fecula, is employed by M. Briquet. He causes it to be spread over the face, and to be renewed once or twice daily. He says that it produces abortion of the pustules, and prevents the swelling attending the confluent form of variola. The same means have been recommended by Prof. Bennett, of Edinburgh (*Edin. Monthly Journal of Med. Science*, Jan. 1850.).

159. A compound mercurial *plaster*, called the "plaster of Vigo," is often employed for the prevention of pitting by French physicians. According to M. Briquet, if mercurial plaster be applied before the fifth day of the eruption, one of two things happens — either the pustules disappear by resolution, or they are changed into vesicles or into tubercles. The latter change is more rare, and seldom takes place except on the face. When

the dressing is removed, small, hard excrescences, insensible to the touch, are seen, which gradually fade, and disappear at the end of ten or twelve days, partly by resolution and partly by desquamation, and without leaving any trace. The mercurial plaster must be kept on from eight to twelve days. (*Gaz. Méd. de Paris*, Avr. 1846.)

160. A solution of corrosive sublimate — one grain to seven ounces of distilled water, and a drachm of laudanum—applied by compresses kept wet with it, is also said by Dr. BULKLEY to produce very marked effects in causing the disappearance of pustules, even after they have fully matured; and he adds that simple mercurial ointment is much more frequently used, both in Europe and in America, than either the plasters of Vigo or the wash of the bichloride, and is probably equally efficacious. It may be applied freely with a brush, or a camel's-hair pencil. Dr. STEWARDSON, of Philadelphia, speaks very favourably of its effects (*Amer. Journ. of Med. Science*, June, 1843. *See also* Dr. BULKLEY's *Notes to* Dr. GREGORY's *Lect. on Erupt. Fevers.* New York. Ed. 1851, p. 351.).

161. iii. INOCULATED SMALL-POX should be treated according to the principles already insisted on, and with strict reference to the type or character of the primary fever, and other features of individual cases. The SUTTONS and DIMSDALE, whose reputation for successful inoculation became so remarkable about the middle of the last century, and somewhat later, insisted upon exposure of the surface of the body to cold air during the primary fever, and upon the full adoption of the antiphlogistic regimen.

162. It was recommended by many physicians who practised inoculation before the introduction of vaccination, to *prepare* the patient by treatment shortly before and after the operation, or until the primary fever appeared. Others considered any preparation unnecessary, and sometimes even prejudicial. Several eminent writers, such as THOMANN, HUFELAND, and others, advocated the propriety of correcting the secretions and excretions, and of promoting a free state of the several emunctories, especially when these appeared to require this aid, by one or more doses of calomel and antimony. FORDYCE, however, considered this practice to be unnecessary, and EYEREL, BOEHMER, and others contended that there is no mode of preparation of any use. GMELIN recommended abstinence from animal food for some time previously to inoculation, but WEIKARD believed even this plan to be injurious. On this topic, Dr. GREGORY very judiciously remarks, "Perfect health being the best condition for receiving and safely eliminating the poison, every thing that tends to diminish plethora, to lessen cutaneous action, to render the bowels free, to preserve the blood in a cool, pure, and normal condition, was found useful. Laxative medicines, a moderate diet, abstinence from all fermented and spirituous liquors, cool chambers, gentle exercise in the open air, light clothing, all contributed, in their several degrees, to the successful result. The antimonial and mercurial medicines, which the SUTTONS laid much stress upon, were useful only to secure the co-operation of the patient in matters of more necessity, especially diet and exposure to the open air." (*Op. cit.*, p. 110.)

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SOFTENING OF STRUCTURE.

— SYNON: *Softness of organs*; — *Mollities*; — Μαλακότης (from μαλακός, mollis); — *Structuræ mollities*; — μαχακοσαρκος, Galen; — *Ramollissement*, Fr.; — *Erweichung*, *malacia*, Germ.

CLASSIF.: — GENERAL PATHOLOGY — MORBID STRUCTURE — THERAPEUTICS.

1. *An individual structure, or part, or organ, may present more or less softness, or diminution of its healthy or normal density, or of its natural state of vital cohesion*; — it may be preternaturally soft, still retaining its usual amount of cohesion; it may be unusually friable, without being softened, or without losing its density; but these states are comparatively rare, for when the one property is impaired the other is also diminished, and *with softening cohesion is generally proportionately lessened*. Softness of structure is commonly not merely physical, but also vital. The structure evinces an impaired cohesion of its molecules, and a diminished vital resistance to external agents. When treating of the changes evinced by individual structures, I have always described, as one of these changes, diminution of their cohesion, or softening. Thus softening of the brain, *Mollities cerebri*, is considered in the article BRAIN; softening of the heart, *Cardiomalacia*, in that on the HEART; softening of the stomach, *Gastromalacia*, in that on the STOMACH, &c.

2. I. PATHOLOGY OF SOFTENING OF STRUCTURE. — *Preternatural softness of structure* is sometimes recognised during life; but most frequently comes under the observation of the physician after the dissolution of his patient; and it then becomes sometimes a question how far it may be a post-mortem change. There can be no doubt of much of the softness often found in the brain or spinal cord after death is post-mortem, although the change may have commenced some time before death; and this remark equally applies to softening of the tissues of the *digestive canal*. (See this art., §§ 34. *et seq.*)

3. *Softening of structure may occur after death.* — 1st. From the action of the gastric juice on parts with which this fluid is brought in contact soon after, or at the time of dissolution. — 2d. From infiltration or maceration of effused fluids, and putrefaction.

4. Softening may take place *during life*. — 1st. From congestion, and, still more manifestly, from effusion or infiltration of blood in the structure. — 2d. From inflammatory action. — 3d. From disease of the arteries or veins connected with the softened part. — 4th. From impaired organic nervous power of the part, causing impaired nutrition, sometimes with serous infiltration, or with fatty degeneration, or with a certain amount of either of these. Softening of structure after death has been noticed when treating of changes observed in the digestive canal and in other organs; but I shall here offer a few remarks on the pathological conditions of which it is a consequence during life.

5. i. The several changes just enumerated as most frequently producing softening of structure are chiefly concerned in causing this effect in particular organs or parts. But there are other states which occasion a *more or less general softening or loss of vital cohesion in most of the structures of the body*; and this softening may exist in a very remarkable degree throughout the whole frame, excepting the bones. It is presented to us during life chiefly in pestilential diseases and malignant fevers, and occasionally as a result of virulent poisons. The softening of the structures in these distempers is a consequence, as I have shown when treating of these distempers, 1st., of impaired and vitiated organic nervous influence; — 2d., of a contaminated state of the blood, with an impaired crasis of its fibrine, and change of the blood-globules; these two prime factors of ulterior alteration acting and reacting on each other. The softening of structure in the more severe cases of the several pestilences, and in the more malignant of exanthematous and continued fevers, had been in great measure overlooked until I described it in early parts of this work and in other places; and to what I have advanced respecting these diseases, under their several heads, I must refer the reader for my description of this remarkable change — this general diminution of vital cohesion of the tissues — at an advanced stage of the malady, or towards the close of life, with the rapid accession of putrefaction after death. This general and rapid form of softening may be called *acute general softening of the tissues*, to distinguish it from *partial or limited softening*, on the one hand, and from *chronic general softening* on the other.

6. ii. When softening of structure is *partial as to its seat*, or *limited to a single structure or organ*, it is a consequence of one or more of the pathological states enumerated above (§ 4.). — *A.* It may be the result, or the concomitant, of *congestion of blood* in the capillaries of the part, or of an *exudation of blood* from these vessels, and of the infiltration of it in the substance of the part. When the vital or the organic nervous influence of the part, and of its vessels, is impaired, the blood is liable to congestion in the vessels, or to further change; and, as a consequence, or as a concomitant of this state, softening of the part is liable to supervene. If, as a result of this change in the capillaries and their contents, blood be effused into the structure of the part, softening still more certainly ensues, and with a rapidity proportionate to the failure of vital power and resistance in the surrounding parts. The softening which is observed in congested and enlarged spleen, whether occurring primarily, or as a consequence of periodic fevers, and some of the cases of softening of the lungs are illustrations of the consequences, or of

the concomitant effects, of congestion of a simple or asthenic kind; whilst the red softenings seen in portions of the brain, and the softening with ecchymoses and bloody infiltrations, observed in several viscera and structures in scurvy, purpura, asthenic hæmorrhages, and in malignant or putro-adynamic fevers, &c., show the great extent to which softening proceeds when it is accompanied with exudations of blood. In all cases, when blood is exuded, infiltrated through the structure, or accumulated in masses, and retained even for a short time, softening of an inflammatory kind, although asthenic as to tone, certainly supervenes, and extends, more or less, according to the grade of vital resistance.

7. *B. Inflammatory action* is generally attended by softening of the affected parts; and when softening has not become apparent, or even when the part seems more dense, owing to the infiltration of a concrescible lymph, there is a defect of vital cohesion, as evinced by increased friability. The sthenic and chronic states of inflammation evince less softening and friability than the more asthenic and acute states. Erysipelas and other spreading inflammations, and still more the diffusive inflammation of cellular and adipose tissues, are often attended by softening, amounting to diffluence and disorganisation; and in proof of these changes, I have only to refer to these maladies, and to the art. GANGRENE.

8. *C. Disease of the arteries and veins*, especially of the former class of bloodvessels, is a very common cause of limited softening of organs. Obliteration of an artery, or even specific deposits in the coats, or other changes affecting the calibre, or impairing the healthy action of the vessel, as atheromatous or fatty deposits, may impair the nutrition of the part supplied by the diseased vessel, and thereby occasion softening and impaired vital cohesion of it. Instances of this connection or sequence, or even sometimes concomitance, of alteration, are often presented in the brain, heart, and other parts. Softening in these cases, more especially in the heart, is sometimes associated with a fatty degeneration of the structure of the organ. (See the chapter, in the article HEART, *on fatty degeneration of its structure*, §§ 224. *et seq.*) I have stated, when treating of *apoplexy*, that the change in the vessels of the brain, and in those of the heart, are sometimes the same at advanced age; and that whether the change be specific deposits in, or atheromatous or fatty degeneration of, the coats of the vessels, they frequently exist in the vessels of both these organs, and account for the not infrequent complication of disease of the heart with either apoplexy or palsy.

9. When the change in the arteries consists of atheromatous deposits in their coats, — which deposits were described by me in 1830, when writing on the diseases of arteries, and were stated to "consist of a suety matter, greasy to the touch," &c. (*see art.* ARTERIES, § 59.), — then the structures supplied by arteries thus affected are often not merely softened, but also otherwise changed; the softened part being flabby, and as if infiltrated with serum, and with more or less oil-globules. In other cases, especially when this change in the arteries is connected with softening of the cerebral structure, serous effusion often accompanies it, especially into the adjoining ventricles, and occasionally as an infiltration of the softened structure; this effusion being probably the result of the physical condition of the organ, and either of the state of circulation in the part, or in its vicinity, or of the atrophy sometimes attending softening. Whether or no softening of the cerebral structure is attended by more or less of fatty degeneration, as observed in the heart, has not been ascertained; but it is not improbable that the fatty elements, contributing in their various degrees, to produce what has been recently, and not always correctly, described as fat (and of which the earliest notices are contained in various articles of this work, especially ARTERIES, § 59.; DISEASE, §§ 135. *et seq.*; HEART, STRUCTURAL CHANGES OF, §§ 224. *et seq.*; PLEURA, § 100.; SEROUS MEMBRANES), are more or less augmented above the natural standard in the softened structure of the brain; the healthy structure of the organ containing from three to eight per cent. of fat, which exists chiefly in the medullary structure.

10. Disease of, or obstructed circulation through the *veins*, produces softening of the tissues, the blood of which passes to the affected veins; but the softening generally presents peculiar characters. It is always attended by great congestion, or infiltration of serum, or ecchymoses, or by all three. The vital tone or cohesion of tissues thus circumstanced is already partially lost; and when they are subjected to any irritation, inflammatory action of an asthenic character, is soon produced, which rapidly spreads, still further softens the part, and ultimately destroys its cohesion and organisation.

11. *D. The organic nervous influence* of a part is more or less impaired, either previous to, or in connection with, the changes already noticed as productive of softening. But this influence may be impaired primarily, and chiefly, and independently of any of the changes now adduced. It is thus impaired either congenitally or hereditarily, or by the injurious agents in operation during early life; and the consequences are a preternatural softness and flabbiness, and impaired vital cohesion, of all the structures, not excepting even the bones, which, as shown in rickets and scrofula, are not only slowly and imperfectly developed, but more or less softened, especially in their spongy parts. This *chronic form of general softening* may exist in the fœtus, without being hereditary; it may be hereditary, and yet not appear until some indefinite period after birth, as when it proceeds from scrofulous parents. It may be acquired from the nature or the supply of nourishment, or from the want of pure air, &c.; the scrofulous, or ricketty, or tubercular habit of body, being thereby produced in young subjects, and the scorbutic at more advanced ages. *Scurvy* furnishes one of the most remarkable illustrations of chronic general softening, or general impairment of vital cohesion, advancing in a slow and progressive manner, commonly in adults, *rickets* equally illustrating it in children. The general cachexia resulting from the *syphilitic poison*, or from *mercury* acting in poisonous doses or modes, or from the use of the *ergot of rye*, or from other poisonous substances, is chiefly characterised by softening, implicating, more or less, the whole of the structures, although manifested especially in certain tissues, particularly the cutaneous and cellular, the osseous and periosteal, the mucous,

&c., and, in certain of these, passing extensively into *ulceration*, of which softening is a general antecedent.

12. E. *Softening often depends upon the association, in various degrees, of the foregoing morbid states*, especially those causing partial or limited softening, and, even when thus associated, in its slighter grades it may be transitory, as when it occurs from œdema, or saturation of the tissues of a part with serum. Such saturation may proceed from local weakness of the tissue, or of the capillaries supplying it, or from more general debility, or from local changes, as obstruction in the returning circulation of the part, or obstruction of the absorbents, causing this lesion. The serous infiltration may be soon removed, or it may persist, or it may increase, and the attendant or consequent softening may also increase, and even go on to disorganisation; certain intermediate changes, however, sometimes appearing, especially asthenic inflammation. In these cases, the infiltration of serum, by its macerating property, weakens the vital cohesion of the tissue, or, by the possession of an irritating quality, induces a diffusive or asthenic inflammatory action, frequently passing into gangrene. The mere separation of the intimate structure of cellular or adipose parts, by the infiltration into it of an inorganised and inorganisable fluid, if continued long, tends to loosen the vital cohesion of the part; and when this fluid contains, as often occurs, excrementitious or injurious materials, the result is both increased and hastened, especially as it often also associates with it other changes, seated in the vessels supplying the part, tending most rapidly to gangrenous softening.

13. Œdema, or serous infiltration of the substance of the brain, whether the antecedent or the concomitant of softening of the cerebral structure (for it may be either the one or the other), generally induces and accelerates the softening process in this structure more remarkably than in any other organ; complete disorganisation, or decomposition, being thereby often rapidly induced.[*] Few parts, either by their physical condition, or by the nature of their organisation, are more frequently subject to serous saturation than the brain; and although the serous exudation is most frequently excessive between the membranes and in the ventricles; more or less fluid being always in these situations, — still the excessive accumulation of it in the ventricles will often affect the vital cohesion of the surrounding structure, so as to predispose to, or occasion softening in this situation or in the vicinity, especially in the scrofulous diathesis and in ricketty habits, in which the vital cohesion of the tissues is generally weak.

14. Congestions of blood in parts, asthenic and erysipelatous inflammations, the accumulation of excrementitial and irritating materials in the circulation, and the operation of animal and contaminating poisons, all in their several grades occasion more or less softening, which is most remarkably manifested in those tissues, the organisation of which is most loose or yielding, as cellular or mucous structures and parenchymatous organs. In these, especially, the softening is followed by the exudation of a fluid, which is neither pus nor concrescible lymph, even when the softening is most inflammatory, but which, in the scrofulous diathesis, is either tubercular, or curdy, or sanious, or an association of these; and in persons who are constitutionally exhausted, or whose blood is self-contaminated or otherwise poisoned, the morbid fluid, serous or sanious, infiltrates the adjoining tissues, softens them with various degrees of rapidity, and ultimately disorganises or decomposes them. These consecutive states of softening, whether manifested in external or internal parts, in cellular and adipose tissues, or in mucous or parenchymatous organs, are presented to our observation in the course of adynamic or malignant fevers, and after the absorption of puriform and sanious matters into the circulation, and in the several forms of erysipelas; and whether puriform matter be formed in the softened part, or a sanious fluid, or a foul, contaminating serum, infiltrating adjoining parts, they always tend to further disorganisation, or decomposition or gangrene supervenes, unless vital power and resistance be reinforced, and the contaminating state of the circulation be counteracted or remedied by suitable treatment.

15. II. The Therapeutical Indications applicable to softening of structures, should be based upon the pathological states from which it appears to proceed, or with which it is associated. But the result of treatment will entirely depend on the acumen of the physician in detecting this condition of structure and the changes in which it originates, and in attributing to each its due influence, and in adapting his means of cure to their several grades and relations. When treating, under their proper heads, of the several states of softening, as manifested in different structures, I then pointed out the measures most appropriate for each; and, reviewing this lesion as one of the most advanced, and as one of the most dangerous, I then more especially considered the treatment most conducive to the removal of the changes from which it proceeds. Whether arising from inflammations, especially the asthenic, — or from congestions, hypostatic or others, — or from obstruction of vessels, arterial, venous, or lymphatic, — or from morbid matters conveyed into the circulation, and thereby affecting predisposed or previously disordered parts, — or from the diminution of certain elements necessary to vital density or cohesion, as phosphorus, or sulphur and their combinations, — or from morbid poisons changing the states of organic nervous power, and of the circulating fluids, more or less, generally, — or lastly from the nature of the food and from states of nutrition, — the treatment of softening of structure has received due consideration, as respects, not only this particular lesion, but also the changes from which it proceeds. In the several articles on Abscess (§§ 62.); Absorption (§§ 15. *et seq.*); Arteries (§§ 40. *et seq.*); Arts and Employments (§§ 23. *et seq.*); Brain, *softening of the* (§§ 214. *et seq.*); Cachexy (§§ 4. *et seq.*); Cellular Tissue (§§ 9. *et seq.*); Choleric Fever of Infants (§§ 11 *et seq.*); Congestion of Blood (§§ 12, 13.); Debility (§§ 25. *et seq.*); Digestive Canal, *softening of* (§§ 34. *et*

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[*] It is not improbable, that softening of the nervous centres is favoured, if not caused, by a deficiency of sulphur or of phosphorus, or of both, and of their combinations, in the cerebral structure, these substances being always present, but in varying quantity in this structure, in its normal states.

seq.); Dysentery, Asthenic (§§ 88. *et seq.*); Erysipelas (§§ 64. *et seq.*); Fever (§§ 559. *et seq.*); Gangrene (§§ 57. *et seq.*); Hæmorrhage (§§ 40. *et seq.*); Heart, *softening of* (§§ 216. *et seq.*); Inflammation, Asthenic (§§ 236. *et seq.*); Intestines, *softening of*, (§§ 131. *et seq.*); Œdema, Pestilences, especially the Hæmogastric and Plague (*in numerous places*); and Scrofula.

16. In the treatment of softening of individual structures, as well as of the general softening of the tissues consequent upon malignant fevers, and morbid states of the circulating fluids, attention should be chiefly directed to those pathological states of which softening is the consequence; and these ought to be either removed or counteracted by means suited to these states, the most important of which have been indicated above (§§ 6. *et seq.*), or more fully mentioned in the articles just referred to. But it should always be remembered, that the removal of the causes; a supply of deficient elements, in medicines, aliments, and mineral waters; a suitable diet and regimen; a pure, dry, and bracing atmosphere, with free ventilation; a healthy discharge of the digestive functions, and the use of pure, or appropriate mineral springs, are the chief means of cure.

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SPASM: — Synon. — *Spasmus.* *σπασμος* (from *σπαω*); *Hyperkinesia* (from ὑπὲρ, and χίνησις). I. Frank; — *Mobilitas nervosa nimia*, Auct. var. — *Ataxia Spirituum*: — *Spasmes*, Fr.— *Krampfe*, Germ.— *Cramp.*

Classificat. — II. Class. — II. Order (*See Preface*).

Definit. — *Involuntary or abnormal actions of muscular parts: or, in other words, contractions of muscular structures, different in continuance, or in severity, or in recurrence from healthy action; constituting a generic pathological condition; and although most commonly a sympathetic, yet an important morbid state.*

1. I. Varieties of Spasm.—The ancients comprised under the term, spasm, all convulsive affections or movements, but the sense in which the word is now and more strictly applied, is the contraction or tension of a muscular structure, independently of volition, and often disposing to or followed by convulsion. Spasm, or cramp, frequently exists without convulsion, it may affect either voluntary or involuntary muscles; and, in either of these situations presents varying characters; and it may be attended by consciousness, or by an abolition of sensation, or even by various derangements of sensibility and mental manifestation. The supporters and followers of the nervous system of pathology, especially Stahl, Hoffmann, Juncker, Sauvages, Cullen, and others, attached great importance to this morbid condition, and sometimes inferred its existence, especially in internal and involuntary structures, where there was no evidence of its presence. Although the partial revival of the humoral pathology, to which the early articles of this work have in no small measure contributed, especially those on the Blood, on Disease, on Absorption, Excretion, Infection, &c., has, in some degree, diminished the importance which had been attached to spasm, as an influential pathological state, still it performs a part of considerable interest in the general doctrine of disease.

2. Sauvages arranged under spasm, all involuntary muscular contractions, and divided them into *tonic* and *clonic*. Under the former appellation he comprised those contractions which were, more or less, permanent or continued; under the latter he ranged those which alternated with relaxation; and both forms of spasm he divided into *partial* and *general*. *Partial tonic spasm*, according to him, embraced strabismus, trismus, torticolis, priapism, and cramp attacking any of the voluntary muscles. *General tonic spasm* consisted only of tetanus and catalepsy. *Partial chronic spasms* were carphologia, pandiculation, tremor, palpitation, &c.; and *General clonic spasms* were, eclampsia, epilepsia, hysteria, chorea, &c. Cullen adopted the view of Sauvages, in constituting spasmodic affections a distinct order of nervous diseases. Pinel, however, did not consider that the spasmodic state should be made the basis on which an order of disease might be founded.

3. It is very doubtful, whether or no, catalepsy should be viewed as a species of general tonic spasm, or even as a spasmodic affection at all. I have seen several cases of true catalepsy, and in these there was no increased action of muscles apparent. In cataleptic ecstacy, however, many of the voluntary muscles are, more or less, contracted; and when catalepsy occurs in connection with hysterical attacks, muscular contractions often precede the cataleptic state. In most of the convulsive affections arranged under eclampsia, epilepsy, and hysteria, the seizure is generally tonic at its commencement, and clonic towards its termination; so that it is very difficult to distinguish between those convulsive or spasmodic affections which are tonic, or which are clonic, these terms being altogether conventional, and the morbid states which they are intended to represent, passing gradually and insensibly from the one into the other.

4. MM. Pinel & Bricheteau divided spasmodic affections into those which are unattended, and which are attended by lesion of the faculties of intelligence. Dr. Mason Good arranged these latter, under the genus, "*Comatose Spasm*," assigning convulsions, hysterics, and epilepsy, to it, as species. But hysterical spasm is often unattended

by any comatose affection, or loss of sensibility; and here, as well as in other morbid conditions, the difficulty of classification becomes apparent. Dr. GOOD divided his order of spasmodic affections, or nervous disorders affecting the muscles, into three genera, consisting of "Constrictive spasm," of "Clonic spasm," and of "Synclonic spasm." The *first* of these comprised priapism, wry neck, distortion of the spine, muscular stiff-joint, cramp, locked-jaw, tetanus, rabies, and suppressed pulse; the *second*, hiccough, sneezing, palpitation, nictitation, subsultus, pandriculation; the *third*, tremor, chorea, shaking palsy, raphania and barbiers.

5. Dr. GOOD defined his genus "*Entasia*," or constrictive spasm, to be "irregular muscular action producing contraction, rigidity, or both." The genus *clonus*, or clonic spasm, he described as "forcible agitation of one or more muscles in sudden and irregular snatches," or, in other words, agitative or tremulous motions of the muscles. The genus *synclonus*, or synclonic spasm, he stated to be "tremulous, simultaneous, and chronic agitation of various muscles, especially when excited by the will," or a "multiplied conjunctive or compound agitation, or tremulous motion." The reader, upon consideration of the above definitions, will be at a loss to perceive the generic differences between the genera, clonus and synclonus, and he may not be satisfied that tremor and shaking palsy should be ranked as species of spasm.

6. Spasmodic action may occur in either voluntary or involuntary muscular structures. In the former it may be limited to one or more muscles, or extended to several, or even more or less generally; it may also, when so situated, be either simple, or associated with unconsciousness. In the latter class of structures, it is always partial or limited, and is generally complicated with irritation, or congestion, or inflammatory action, in adjoining or related parts. Spasm, moreover, is most frequently and strictly a *symptomatic* affection, and is rarely a *primary* or *idiopathic* disorder, unless when it occurs in the form of cramp, or from over-exertion of the muscles affected, or from bringing muscles that have been long disused into action.

7. Spasm may be arranged into, 1st., that affecting involuntary muscular structures, or those parts which are supplied only or chiefly by ganglial nerves; 2d., that attacking muscles which are influenced by voluntary nerves; 3d., spasm implicating both involuntary and voluntary structures; and 4th, spasm associated with want of consciousness. When spasm is seated in either involuntary or voluntary parts, it may be of varying duration; it may be continued for a time and then permanently relaxed; it may be thus continued and afterwards recurrent or convulsive; or it may be recurrent or agitative from the commencement, thus presenting either of, or all, the forms classed by Dr. GOOD as tonic, clonic, and synclonic, and being either partial, or limited, or more or less general. The limited states of spasm may be of considerable duration, and may even pass into a state of permanent contraction, although this may be a rare occurrence. Several of the unnatural positions of organs or parts, as those of the eye, extremities, &c., have been attributed to spasm of particular muscles; and probably the mal-position may have originated in this state, the contraction becoming permanent, whilst the spasm no longer existed; but it may have equally originated in a paralysed condition of antagonist muscles. In these cases care should be taken to distinguish between tonic spasm, permanent contraction of muscles or parts, and the deficiency of antagonist action.

8. i. *Spasm of involuntary structures* is an element of several diseases. It is most common in the digestive canal, in various parts of which it may exist in succession, generally in a recurrent, although sometimes in a more continued form. It may be limited to this canal, or be extended to adjoining parts, or even to voluntary organs. It may, when affecting the alimentary canal, be merely an exaltation of the peristaltic motion, as in diarrhœa or dysentery; or it may be more severe and attended by inverted action, as in vomiting, spasms of the pharynx or of the œsophagus. In these cases the spasmodic state is favoured either by extreme debility and sensibility of the seat of the disorder, or by inflammatory irritation, and is directly occasioned by any irritating substance. In any circumstance, the spasmodic action will be produced by irritations sufficiently great to excite it; and when the vital power of the parts is low, and the susceptibility great, even the accumulation of the natural secretions within these parts, or a vitiated state of the secretions, is sufficient to cause spasm, as evinced by certain states of diarrhœa, by vomitings, by colic, bilious cholera, &c. When any irritating body is brought in contact with the mucous surface of the digestive canal, whether that be gaseous, fluid, or consistent, spasm will generally affect the parts thereby irritated, or their more immediate vicinity. The same effect follows inflammatory action and ulceration, which are often followed by spasmodic action, as demonstrated in various parts of this canal, in the pharynx, the œsophagus, the stomach, the duodenum, the small and large intestines. Similar causes produce similar effects in the urinary passages, and even in the respiratory passages. In these latter the spasmodic action is often the most remarkable, and is generally followed by very manifest effects.

9. Various involuntary canals or parts have been supposed to be seats of spasm in certain disorders without sufficient reason. Thus the gall-ducts have been accused of spasm in some states of jaundice, and the capillary vessels in the cold stage of fevers. That irritating or morbid bile, or irritants at the mouth of the ducts in the duodenum, may cause spasm of these ducts, is very probable, but there is no palpable demonstration of this effect. That there is an apparent constriction of the capillaries, especially of those on the surface of the body, is very manifest in the cold stage of fevers and in states of vital depression; but it does not follow that the constriction is the consequence of spasm. It is merely the result of the contraction of these vessels upon a deficient amount, or the entire absence, of their contents, which are no longer propelled with sufficient power to fill or distend them, during these states of the frame.

10. Spasm of the parietes of the cardiac cavities has also been inferred to be present in cases of nervous palpitation; and when death has taken place suddenly, without any manifest organic lesion. That nervous palpitation is truly spasmodic, even when most exalted, is extremely doubt-

ful. There is certainly remarkably increased action and impulse with all the symptoms described when treating this affection of the heart (*see art.* HEART, §§ 43. *et seq.*); but morbidly increased action is not quite identical with spasm, although often nearly approaching it. With increase of action, prolongation or irregularity of the contraction is generally present in the spasmodic state. If we admit the occurrence of spasmodic or spastic contraction of the parietes of the heart of a much longer duration than that which takes place normally, death must necessarily follow; but I much doubt the existence of this lesion, especially in such grade or continuance as to occasion death. It certainly has not been satisfactorily demonstrated, although admitted by some writers.

11. ii. *Spasm of voluntary muscles or parts* is of frequent occurrence, either in the form of cramps of particular muscles, or in that of convulsive action of several or many. Cramps in the extremities may follow over-action of the muscles attacked, or be symptomatic of disorder of the digestive canal, or of latent or inflammatory changes in the brain or spinal chord, or their membranes, or of the irritation produced by the circulation of effete or injurious materials in the blood, as in cholera, gout, &c. They may even follow a certain amount of pressure upon, or irritation of the nerves, supplying voluntary parts, either at the origins, or in the course of these nerves, with or without any other manifest disorder. Cramps or spasm, of the lower extremities especially, often precedes, recurring at intervals, for some time an attack of paralysis or apoplexy, particularly hemiplegia; and they often recur, in slighter grades, during the restoration of the lost power. Spasmodic actions of voluntary parts may result from irritations in their vicinity, or in situations more or less remote, from irritations immediately affecting the nerves supplying these parts, or mediately and indirectly conveyed to them from a distance, as in trismus, tetanus, &c.; and the spasmodic action may be tonic or continued, or irregular or convulsive, or clonic or agitative, or recurring at intervals and occasioning snatches or startings, and various abnormal motions; or it may pass in succession through all those, as in irregular convulsions, in some forms of hysteria, and even in some cases of epilepsy. The spasmodic state, however, is subject to so many variations and anomalies, that it is quite impossible to describe them correctly in all their details at this place. Those diseases, in which spasm, in any of its forms, constitutes a principal element, are fully described, and with especial reference to this morbid condition, under their special denominations; it is requisite, however, to notice certain associations of this condition.

12. iii. *Spasm may affect both involuntary and voluntary parts.* It may extend from one order of parts to the other — most frequently from the former to the latter, if the succession of morbid phenomena be closely analysed, although voluntary parts manifest this disorder most evidently. Spasm, even when affecting most severely the voluntary muscles, may proceed from very remote sources of irritation, as I have shown in several places in this work before the subject was duly considered by any one else. Commencing with those sources which are the nearest to the parts which are morbidly contracted, and concluding with those which are the most remote, we find that muscular structures may experience unnatural action or spasm in some one of its varying forms, — 1st., from irritation in or near the seat of morbid action, as shown more especially in muscular canals — in the digestive, respiratory, and urinary passages; 2d., from irritants affecting the nerves supplying the affected muscles, as evinced in both involuntary and voluntary parts; 3d., from irritation or lesion of the spinal marrow at or near the origins of the nerves supplying these muscles; 4th., from lesion (not necessarily structural) of parts of the brain, or of its membranes, having relations with the nerves going to the convulsed or spastic muscles; 5th., from irritation of any portion of the digestive viscera and canal, or of the generative and urinary organs transmitted by ganglial nerves to the roots of the spinal nerves, or to the spinal cord, and reflected thence by voluntary nerves to the external muscles and members; 6th., from irritation of any of the senses — of hearing, sight, smell, taste, or touch — transmitted to those parts of the nervous centres with which they are respectively in connection, and thence reflected upon parts intimately related to them; thereby producing startings, tremors, sneezing, cough, retchings, or convulsive movements, as either of these senses are irritated or abnormally excited. These several sources of spasmodic action have been sufficiently illustrated in the articles CHOREA, CONVULSION, EPILEPSY, HYSTERIA, SYMPATHY, TETANUS, &c.

13. II. CAUSES OF SPASM. — i. *The predisposing causes* are the same as those fully described when treating of the individual species of spasm, these causes being generally common to all the species, the exciting causes, and the several intrinsic circumstances or peculiarities of the patient determining the form of the attack. Hereditary vice or disposition, congenital conformation, a weak development of frame, the female sex, a warm and humid climate, the ages of infancy, childhood, and puberty, the critical epochs of females, premature sexual indulgence and masturbation, luxurious indulgences and voluptuous modes of living, prolonged indulgence in bed or in sleep, inordinate devotion to music and poetical studies, excitement of the imagination, want of repose, mental anxiety, sleeplessness, exhausting discharges, the sudden suppression of accustomed evacuations, or of external pains; the gouty and calculous diathesis; excited and ungratified, or insufficiently gratified, sexual passions; suppressed emotions; the period of utero-gestation, the puerperal states, abortions, exhausting lactation, inanition; extreme states of vascular plethora, or of anæmia, &c., severally predispose, and often directly produce, some one or other of the usual forms of spasmodic disorder, or such states of spasm as may be considered as anomalous, or different from those commonly described by nosological writers.

14. ii. *The exciting causes of spasm*, whether specific or anomalous, are chiefly influences affecting the mind, the senses, the nervous centres, the alimentary canal and digestive viscera, the sexual and urinary organs, &c.; more especially the violent emotions of mind, whether manifested or suppressed; severe disappointments and losses; strong or strange impressions of the senses, startling noises, disgusting or horrible sights, objects of terror or surprise; violent excitement and the influ-

ence of the imagination: titillation or irritation of the more sensitive parts of the surface, prolonged or violent pain; disordered dentition and dental affections; derangements of the digestive canal, particularly the presence of worms, or of acidity, or of flatus, or of morbid secretions and excretions, or of fæcal accumulations; the passage of biliary calculi, or of disordered bile; irritation or excitement, or functional or structural lesions of the sexual or urinary organs or passages, calculi in the kidneys or bladder; inordinate or prolonged muscular action; various organic lesions or external injuries, implicating either the parts affected, the nerves supplying them, or related portions of the nervous centres or their membranes; sudden or extreme changes of temperature, or electrical conditions of the atmosphere; sudden suppression of discharges, eruptions, or external pain; the drying up of chronic ulcers; the nature of the ingesta, especially acid or unripe fruit, poisonous articles mistaken for food; the poison of lead, and numerous other injurious substances mentioned under the head of POISONS.

15. iii. *The immediate or efficient cause of spasm* — the pathological condition constituting this affection — has been a topic of contention among pathologists. It was generally ascribed to irritation of the nerves supplying the affected muscles, either at their origins, in their course, or at their terminations; or to a sympathetic affection of these nerves propagated from distant but related parts to those thus attacked; or to an irregular distribution through the nerves of the nervous influence or power, and determination of this influence to the affected parts. Towards the close of the last century, RITTER, SPRENGEL, and others, viewed spasm as a result of an alteration of the polarization of the terminations of the nerves in relation to the muscular fibres; and this doctrine, after having been neglected for half a century, has been revived at the present day, and supported by the connection established between magnetism and electricity. This latter theory may admit of a certain degree of practical proof, by having recourse to electricity or galvanism, or of electro-magnetism for the removal of spasm, an energetic recourse to either of these, overcoming, as it does in slighter cases, as shown by my own observation, the morbid condition of the muscles. Nevertheless, the same agencies may be viewed as equally successful in the removal of spasms, on the assumption of their dependence upon the irritation of the nerves in any way related to the affected parts. The *juvantia* cannot always prove the nature of the affection. I have seen, as far back as 1820, the most severe cases of tonic and of clonic spasm produced by the internal strangulation of a minute portion of the small intestines, and by the irritation of worms in the bowels, the violent affection of the voluntary muscles having arisen from those causes and ceased with them, the irritation having been propagated by ganglial nerves to the roots of the spinal nerves, and thence reflected upon the muscles in whch these latter nerves terminated; the history of these and numerous other cases favouring rather the old doctrine of irritation of nervous distributions than the less old and recently-revived theory of altered polarization of the nervous fibres, with relation to the muscular tissue, in producing spasmodic actions.

16. III. DIAGNOSIS OF SPASM.—The existence or non-existence of spasm is in many cases remarkably evident; but, in many others, even as respects some disorders which have been viewed as spasmodic, the evidence is by means satisfactory. As to the insufficiency of this evidence in regard of some disorders, I have already hinted. We have no proof of spasm in any quarter in cases of *catalepsy* of a true pathological form; at least, I could detect none upon a close examination of several cases. The several forms of true *tremor*, as arising either from mental emotion, or from mineral or other poisons, or from functional or structural changes, evince no true indication of spasm. The disordered motion is merely the result of an imperfect determination or transmission of nervous power to the tremulous parts, owing to an insufficient or an interrupted supply of this power from the voluntary or involuntary nervous sources, as either voluntary or involuntary parts are affected.

17. Various *paralysed parts* may present states which may be mistaken for spasmodic affections; and the paralysed state may rapidly pass into the spasmodic, and this latter into the former, which is much the most common. The existence, the morbid relations and the transitions of both these morbid conditions thus become extremely important. *Hysteria*, the *convulsions*, and other spasmodic and anomalous affections of infants and children; diseases of the brain, or of its membranes, in the same class of subjects; diseases or injuries of the spinal marrow, &c.; epilepsy, apoplexy, paralysis, &c., either frequently or occasionally, present more or less of spasmodic action, often passing suddenly or rapidly into one of entire loss of power. The irritation, softening, effusion, compression, or other original morbid change affecting the nervous centres, whilst slight, or in a lesser degree, may occasion only cramps (spasmodic motions), but, when increased relatively to the state of nervous power, may cause the loss of all motion. We thus often observe, that several maladies commence with more or less of spasm, or cramps in the extremities, especially the lower, and soon pass into the paralysed state; apoplexy, epilepsy, paralysis, and various other specific and anomalous affections of the nervous system, manifest in many instances this succession of lesion and of resulting phenomena.

18. Dr. M. HALL is of opinion, that the spasmodic affections ushering in many cases of these maladies commence, or are seated, in the superficial muscles of the neck; and that the spasm of these muscles, by compressing the larger veins, occasion congestion of the brain, and the several consequences of congestion when the spasm is not soon relaxed. He believes that "certain causes and principles, emotions and irritations, act directly or diastaltically upon the muscles of the neck," inducing what he designates "*Trachelismus*": — "If this spasm can be dissolved, all its effects cease more or less perfectly." That the muscles of the neck are affected with spasm in many cases of hysteria, especially in the more severe or paroxysmal, cannot be doubted; and that those seizures which originate in violent mental emotions are often thus characterised, or even thus originate, may be conceded; but the spasm of these muscles is not so general, nor always so early in the procession of morbid phenomena, as Dr. M. HALL supposes. When it does exist, and is either severe or protracted, the consequences which fol-

low are generally serious; and it then constitutes an important portion of the courses of morbid actions and changes, each successive portion being the cause of that which follows it, as it is itself the consequence of that portion which precedes it.

19. Spasm of involuntary muscles must necessarily be imputed to irritation of the ganglial nerves supplying these muscles, or to some alteration in the relations subsisting between the nervous and muscular fibres of the affected part. But when spasm attacks voluntary muscles, the irritation has been generally supposed to be seated in, or to implicate, the voluntary nerves. It is, however, very doubtful whether the spasm of these muscles is so generally caused by irritation of voluntary nerves as is commonly believed. It is very probably so caused in many cases, as shown by injuries of the spinal chord, and by inflammation of this part of the nervous system or of its membranes; but there are various diseases, in which spasm performs a chief or a subordinate part, where irritation of any part of the voluntary nervous system is by no means demonstrable, either the muscular fibres or the ganglial nerves supplying them being much more probably the primary seat of such disorder. In trismus and tetanus, in which the voluntary muscles are so severely contracted, there is no proof that the voluntary nerves are primarily implicated; for volition produces no effect on the spasm, and whatever lesion these nerves present, in some cases merely, may be consecutive much more probably than primary. In the most severe cases of spasmodic cholera, in violent cases of colic or ileres, and in others where a very limited injury is sustained by a portion of intestine, as in partial strangulation, I have seen the spasm of the voluntary muscles as general as in tetanus, and continue in this state for long periods, and yet the cerebro-spinal nervous system must be inferred to have been free from all irritation but what was propagated to the spinal nerves from the ganglial nerves supplying the digestive canal.

20. IV. THE PROGNOSIS OF SPASM may be most favourable, or the most fatal, according to the seat of spasm, and the circumstances in which it occurs. A spasmodic affection may terminate the life of an infant in a few seconds, especially when it is caused by disease about the base of the brain, or near the medulla oblongata, or thin membranes; or it may cease in a very few minutes, where it is produced by acidity or by any other source of irritation in the alimentary canal. Clonic spasm of the diaphragm may arise, especially in young persons, from the deglutition of a hard or imperfectly masticated substance, or from acidity, flatulence, &c., or it may be the indication of a fatal issue in many acute and even chronic diseases. It may proceed from inflammatory action or irritation of one or more of the digestive organs, or from the sinking of vital power preceding dissolution.

21. Spasm affecting either involuntary or voluntary parts is not attended by danger when it occurs in hysterical or nervous females, or when it cannot be traced to disease or injury of the brain, spinal marrow or their membranes, or to antecedent or existing visceral disease, pectoral or abdominal. When however it has been preceded or is attended by inflammatory action, or by hemorrhage, or even by evidence of congestion of any important organ, or by effusion into any cavity, especially if hæmorrhage has been excessive or effusion great, spasms of any part, and more particularly if they affect the diaphragm, or even the pharynx, œsophagus, or stomach, are a most unfavourable, and generally a fatal, symptom.

22. Spasms of either voluntary or involuntary muscles are always indications of great danger when they appear in the course of malignant or other fevers, and especially in an advanced stage of those fevers, or when they are present in pestilential distempers, or at the commencement of acute inflammation of abdominal organs or at an advanced stage of chronic visceral or structural disease; the amount and imminence of danger depending upon the violence or malignity of the disease, upon the contamination of the blood, upon the stage of the malady at which spasms occur, and upon their seats and extension. Spasms affecting the muscles of the superior extremities are always much more dangerous than those of the lower extremities, and, when they extend from the former to the latter, the danger is extreme.

23. Spasms of voluntary muscles attending gout or rheumatism are readily removed when they are caused by acidity and flatulence, or accumulation of morbid secretions and excretions in the intestinal canal or in the biliary organs; but when in these diseases spasm appears independently of the disorders just mentioned, or when structural change is detected in the heart, or when the state of the urine indicates disease in the urinary organs or passages, more or less danger should be apprehended; and, although present risk may be averted, a future attack, with its contingent danger, may supervene sooner or later.

24. Spasmodic attacks consequent upon protracted lactation, upon menorrhagia, or profuse leucorrhœa, or upon other exhausting discharges, or upon manustupration or venereal excesses, or upon inanition or anæmia, are frequently temporarily removed by treatment; but they return, or assume a more serious aspect, if the morbid condition in which they originate be not removed by appropriate means, or they may pass from the hysterical character, in which they generally first present themselves, into the epileptic or into mania or confirmed insanity.

25. Spasms occasioned by the extent or seat of injuries generally excite great anxiety, and are most frequently attended by danger. But the amount of danger, or even the absence of it, depends chiefly upon the nature and seat of injury, and the amount of vital shock (*see art.* SHOCK), attending it. When the cranium or spinal column is the seat of injury, when there is a penetrating wound or compound fracture, or when vital sinking indicates the violence of the shock sustained by the frame, the presence of spasm not merely complicates the injury, but also indicates its severity, and the imminent danger attending it.

26. V. TREATMENT. — It is obvious that the treatment of spasm should in great measure depend upon the seat and nature of the disease, of which the spasmodic symptoms form either a subordinate or a most prominent part. When the spasm is more than a symptom, depending upon some special malady; when it constitutes an early, predominant or principal morbid condition, either with or without loss of consciousness, it presents,

according to its antecedent or associated and peculiar phenomena, certain special forms, which are described under the several heads of *chorea*, *convulsions*, *epilepsy*, *hysteria*, &c., and for each of which, in its several varieties, the treatment is fully described. It therefore remains only to state those general principles or indications which experience indicates or contra-indicates, under certain circumstances and morbid conditions with which spasm is generally allied.

27. It would appear from what has been stated above, that one or other of the different forms of spasm is contingent upon, or is produced by, one or other of the following pathological states, — 1st, congestion; 2ndly, inflammation; 3rdly, irritation caused by acid, acrid, or otherwise disordered secretions and excretions; 4thly, a contaminated state of the circulating fluids; 5thly, some structural lesion or injury affecting adjoining or remote nerves or the origins of nerves; 6thly, extreme exhaustion of organic, nervous, or vital power; 7thly, the excessive action of muscles, and the contraction of muscles independently of a co-ordinate or sufficient determination of volition to them; 8thly, punctures or other injuries of tendons, nerves, or fibrous membranes; 9thly, the irritation of the sexual or urinary organs; and 10thly, two or more of these states conjoined. It will be seen, from a consideration of these antecedents, that spasm is most commonly a symptom of certain disordered or morbid conditions, to which attention should chiefly be directed in its treatment, and that it is only when produced as just indicated in the seventh and eighth of the above series of causes or circumstances, that spasm can be considered as a primary or idiopathic disease. (See arts. TETANUS and TRISMUS.)

28. *A. Congestion*, in connexion with spasm, may be viewed both as an antecedent and associate of this latter condition. It may, moreover, be further associated, as with irritation or some structural lesion; and as long as these are in existence, so long may the spasm continue or recur, as various concurring causes may favour its return. The existence of congestion is often difficult to determine; for when the spasm implicates any part of the respiratory apparatus, or when it is so general as to give rise to convulsions, with or without loss of consciousness, the congestion which is then made manifest is more the result of the spasm than the cause of it. Congestion of the brain, or near its base, especially if consciousness be lost, and congestion of the lungs and cavities of the heart, are common effects of general spasm or convulsions, especially when any part of the respiratory passages is affected. Congestion may certainly exist in either organ antecedently to either spasm or convulsion, for it is frequently the cause of both; but the spasm may increase the congestion, and it may even be the cause of relaxing the spasm when the congestion becomes extreme. This latter effect takes place chiefly in extreme congestion of the brain, when consciousness is lost; the congestion, in connexion with the circulation of imperfectly oxydised blood in the brain, both relaxing the spasm and permitting the renewal of air in the lungs. The more moderate congestion in these cases first occasions spasm or convulsions; but when the congestion of unoxidised blood, increased by the convulsions, becomes extreme, then the spasms are relaxed and altogether resolved, and either natural respiration is resumed, or death takes place from the cessation of respiration, owing to the effect produced by the congestion at the origins of the respiratory nerves. In cases of spasm, thus arising or thus associated, the treatment must be directed by the following intentions: namely, 1st, to diminish or remove congestion by means which experience has shown to be most efficacious in obtaining this object; 2ndly, to prevent the recurrence of this condition and its contingent effects.

29. *a.* Spasm depending upon or connected with congestion of any vital or important organ has been too generally treated by large vascular depletions, both general and topical. In young, robust, and plethoric persons, and when the spasms have been consequent upon the stoppage of accustomed discharges, both the one and other mode of depletion may be employed, but with extreme circumspection, more especially during the attack. In most even of these cases, local depletions are the safest and most efficacious; for when the circumstances just mentioned as warranting the depletion are not manifestly present, or when the patient is of a nervous temperament, either the local depletion should be small, or it should be altogether dispensed with, and other means be chiefly confided in. When local depletions are indicated, cupping is the most beneficial; and when the loss of any blood is justly dreaded, then dry-cupping may be resorted to. The circumstances indicating depletions, as well as those contra-indicating them, require for their recognition great discrimination, guided by an enlightened experience, and are such, in their natures, complexities, and varied successions and associations, as to be estimated correctly only at the moment by the closely observing physician. When therefore there is any doubt as to the propriety of bloodletting, it will be preferable to resort to dry-cupping, and to emetics and purgatives, conjoined with stimulants and antispasmodics, — with these latter more especially when nervous energy is much reduced or originally weak.

30. *b. Of emetics*, especially when spasm is imminent, or when it attacks any part of the respiratory apparatus, the most energetic is the *tinctura Lobeliæ*, or *Tinct. Lobel. Ætherea*, given with vinum ipecacuanha to ensure its emetic operation, or with sulphas zinci. When vital or nervous power is much reduced, it may be given with spiritus ammoniæ aromaticus, or with camphor. When bloodletting is manifestly indicated, or when congestion of, or vascular determination to the brain is urgent, then depletions and derivatives, as mustard pediluvia, should precede the exhibition of an emetic; and the affusion of cold water on the head, or cold sponging, may also be practised, the emetic operation and the relaxation of spasm being often promoted by these means. When congestion of the liver is connected with spasm, local depletion or dry-cupping, or both, are often required, and then the preparations of colchicum may be given, at first in a large dose, either with or without an emetic conjoined, and afterwards relinquished for purgatives and antispasmodics. The operation of the first dose of colchicum should be carefully watched, particularly when large, and, if vital depression follow it, stimulating antispasmodics, as ammonia, camphor, valerian, &c., be exhibited. The spasms or

convulsions which sometimes occur on the invasion of exanthematous fevers, are often connected with congestion; and for these an emetic and a warm bath are often of service.

31. *c. Purgatives* are generally beneficial, more especially when the liver or brain is congested, and when the spasm is connected with acidity and flatulence of the digestive canal, or with accumulations of morbid secretions, excretions, and fæcal matters, as when spasms occur in colic or in the course of gout, rheumatism, hysteria, hypochondriasis, &c. In these, as well as in some cases of other diseases, not only are morbid excretions thus liable to accumulate, but the blood becomes more or less contaminated by effete materials, which the impaired functions of the emunctories fail of removing. In these circumstances, purgatives should be selected with the view not merely of evacuating the contents of the bowels, but also of promoting the functions of excreting organs. When cerebral congestion is connected with spasms, then active derivative purgatives ought to be exhibited by the mouth and in enemata, and with this view, as well as with the intention of removing spasms by one of the most powerful antispasmodics that can be prescribed, a full dose of spirit of turpentine should be given with castor oil, or with other purgatives, and administered in an enema. When the liver is congested or torpid, as may in many cases be ascertained by percussion, then calomel with camphor, and various other chologogue purgatives, will be most appropriate.

32. *B.* When the spasm is contingent upon *Inflammatory Action*, recourse to vascular depletions, general or local, is commonly required; and what has been stated above (§ 29.) respecting bloodletting is also here applicable to a great extent. It should always be recollected that inflammations accompanied with spasm or convulsion rarely admit of vascular depletions to the same amount as will be safely and advantageously borne in pure uncomplicated inflammation. Indeed the depletions may even increase the spasm without materially diminishing inflammation when injudiciously employed, or when confided in chiefly, and when the inflammation is of an asthenic character. In this latter state more especially, and in other circumstances of this morbid alliance, deobstruent purgatives, conjoined with stimulants and antispasmodics, are required; and even in cases where vascular depletions are most indicated, not merely such purgatives, but also stimulating antispasmodics, may be most beneficial, with other restoratives which the peculiarities of the case will suggest. In some instances an emetic, judiciously selected and combined, will also be of much service, after depletion has been resorted to, when clearly indicated. In the worst form of spasm, as in that contingent upon asthenic or cachectic inflammation, for which bloodletting is generally more injurious than beneficial, the early exhibition of an emetic, followed by purgatives, and by tonics conjoined with alkalies, antispasmodics, counter-irritants, &c., will be found more certainly useful than other means.

33. Spasms of the voluntary muscles, either limited or more or less extended, are often produced by inflammation at or near the origins of the nerves supplying the affected muscles, or by inflammatory action, or irritation of the membranes in the vicinity, or by disease of the adjacent bones, as shown when treating of lesions of the *brain*, *spinal chord*, and *membranes*, or of the *cranium* or *spinal column*; and for these, although general or topical bleeding may be requisite, according to the nature and features of the case, purgatives, alteratives, derivatives, counter-irritants, sedatives, and the other means fully set forth in these articles, are especially required.

34. *C.* The dependence of spasm on *acrid*, *morbid*, *or other irritants in the digestive canal*, is of frequent occurrence, both primarily and unconnected with any special malady, or so associated, as in gout, hysteria, &c. In all these circumstances, emetics, purgatives, anthelmintics, &c., as above recommended (§§ 30. *et seq.*), are indispensable. In the gouty and rheumatic diathesis, equal parts of magnesia and sulphur, taken on several occasions, and followed by a more active cathartic, will be found efficacious; and if there be reason to infer the presence of worms, the spirit of turpentine with castor oil, or anthelmintics, purgatives, &c., will be generally indicated; but they should be afterwards followed by chalybeates, tonics, and antispasmodics, as recommended in the article on WORMS.

35. Irritation of the higher portions of the alimentary canal by the irruption of acrid bile into the duodenum often occasions spasms of the abdominal muscles, and calves of the legs, but these generally subside after the evacuation of the morbid matters; dilution of the acrid secretions by warm emollient fluids, narcotics subsequently, and mild purgatives afterwards, effecting a complete cure, generally in a short period. (See CHOLERA, &c.)

36. *D.* Spasm is not frequently occasioned *by contamination of the circulating fluids*, unless at a far advanced period of febrile and pestilential diseases, as in pestilential cholera, and when the functions of the kidneys are impaired, interrupted, or otherwise disordered. In these circumstances vital power requires support, whilst morbid matters are evacuated, and the actions of the depurating organs are excited by their appropriate stimuli. We should, moreover, endeavour to change or counteract the influence of those materials which thus accumulate in the blood,—to remove or neutralise them. They can be removed only by increasing the functions of the emunctories, and they may be neutralised by appropriate alkaline or mineral agents, and by antiseptic and antispasmodic medicines, as recommended when treating of the maladies in which spasms are most frequently observed.

37. *E. Structural lesions, injuries, &c.* of the bones, or membranes near the origins, or in the course of, the nerves supplying the extremities or voluntary muscles not infrequently occasion spasm of these muscles, and require the means already recommended (§§ 29. *et seq.*), modified according to the nature of the lesion or injury, and to the peculiarities of the case in other respects. In these states of disease the performance of the several excreting functions requires especial attention, and the evacuations a particular examination.

38. *F. Extreme exhaustion of vital or nervous power*, causing spasm or irregular or convulsive actions of voluntary muscles, or of involuntary parts, is often irremediable, especially when it appears at an advanced stage of pestilential or febrile mala-

dies, or after large losses of blood, and in the course of exhausting or contaminating diseases. In these circumstances powerful stimulants and antispasmodics—wine, opium, camphor, ammonia, oxide of bismuth, ammoniated copper, cajuput oil, phosphoric acid, the preparations of sumbul, arnica montana, the ethers, brandy, &c. —are necessary, and one or more of these may be conjoined with such preparations of iron, or of assafœtida, or of valerian, of zinc, of silver, of phosphorus, canabis Indica, or of musk, castor, &c., as the peculiarities of the case will suggest.

39. *G.* When spasm or cramp is caused *by excessive action of the affected muscles*, or by contractions of muscles without a due determination of volition, it generally soon ceases, and requires merely frictions and quiet. If it recur, friction with stimulant liniments, the application of warm embrocations near the origins of the nerves or portion of the spine enclosing these origins; frictions with chloroform or æther, or with turpentine and camphor, either over the affected muscles, or along the spine; and subsequently the cold douche or affusion, or sponging the spine night and morning with a tepid or cold solution of bay-salt, followed by gentle friction with the hair glove, &c., will generally prevent a recurrence of the spasm.

40. *H. Punctures or injuries of tendons, &c.*, are occasionally followed by trismus or tetanus, the most continued and dangerous form of spasm, and one which requires, more than almost any other disease, the most energetic stimulants, antispasmodics, and tonics; the powerful doses of sedative and narcotic substances generally resorted to for this affection tending rather to hasten than to avert dissolution. (See arts. Tetanus and Trismus.)

41. *I.* The *influence of the sexual organs* in producing spasm or convulsion is especially manifested by the female. But there are often other morbid conditions present besides either irritation, congestion, or inflammatory excitement, or vascular determination of these organs. Generally nervous power, especially organic nervous power, is exhausted or depressed, the secretions disordered, and the excretions insufficient or retained; consequently assimilation is impaired, and the blood poor. The affection of the sexual organs is readily induced by mental emotion or desire; and this affection reacts upon the brain and nervous system generally, is propagated by the ganglial system to both the abdominal and thoracic viscera, disordering the functions of the urinary organs, occasioning spasmodic actions of the alimentary canal, respiratory organs and passages, and often exciting spasms or convulsions, or both, by the extension of the irritation to the roots of the spinal nerves, and even to the spinal marrow, medulla oblongata, and brain.

42. The treatment hitherto recommended in these cases has consisted chiefly of stimulants and antispasmodics, and have been but insufficiently directed to the sexual organs and to the mind. The morbid or irritated state of these organs should be removed, and sexual desires suppressed. Instead of stimulants and heating antispasmodics, cooling medicines, as nitre, small doses of camphor, magnesia, alkalies, &c., should be given in bitter infusions, and the mind ought to be occupied agreeably and profitably. When spasmodic affections occur in females or males, especially if the countenance become pallid or sallow, then the most noxious vice of all vices should be suspected, namely self-pollution (see arts. Debility and Pollution); and unless this be relinquished, and the mind be healthily and morally regulated, medical treatment will be of no avail. (See arts. Chorea, Colic, Convulsions, Epilepsy, and Hysteria.)

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SPINAL COLUMN, DISEASES OF.—

Synon.—*Vertebral column; Columna vertebralis; C. spinalis*, Auct. Var. *L'épine du dos, Rachis*, Fr. *Der Rückgrat*, Germ. *The Spine, Spinal Chord, and Membranes.*

1. I. Preliminary Remarks: — The spinal column has attracted to itself a due proportion of attention from medical writers only in comparatively recent times. The diseases of the several tissues, of which this column and its contents consists, were either altogether unknown, or overlooked, or if partially known, undeservedly disregarded, until J. P. Frank, in 1791, published his celebrated treatise on the great importance of this part of the frame in disease. Previously to this period, disorders and lesions of the spinal column and chord received only partial and very imperfect notices from medical and surgical

writers. Some mention of the functions and diseases of these parts is to be found in the works of Hippocrates, Galen, Aretæus, and Celsus; but the structure and functions displayed by them, more especially by the spinal chord, were very imperfectly investigated and understood, until Bartholin and Blasius entered upon this undertaking. Vieussens afterwards, Huber subsequently, and Monro, Frotscher, Ludwig, Gall, and Home, at later periods, cultivated still further this field of research. Injuries and diseases of the vertebral column were treated of by Pott, Paletta, Soemmering, C. Bell, A. Louis and others; whilst the maladies implicating chiefly the spinal chord and its membranes were illustrated successively by Vogel, Portal, Bergamaschi, Brera, Autenrieth, Mussy, Schmalz, Racchetti, Choulant, Ollivier, Brodie, the author, and others; but it was not until the researches of C. Bell, Magendie, M. Hall, Valentin, Stilling, Van Deen, Budge, &c., had thrown additional light upon the structure and functions of the chord, that the diseases of this organ and of its envelopes have been duly illustrated. Even at the present time, it is doubtful whether or not these diseases have received the full amount of investigation, which they have so long required. The reader will find, in the sequel, an account of the works furnished not only by writers now enumerated, but also by many others, who have contributed more or less to the present advanced state of our knowledge of diseases of the spinal column, and of the very important tissues which this admirable structure contains and protects.

2. *A.* It may not be disadvantageous to take *a brief survey of various topics connected with the pathology of the spinal column, and of the parts which it contains, especially in relation to certain agencies, and to other maladies, with which affections of these structures are often more or less intimately associated.*

3. *a.* During the several forms and stages of *fever*, periodic, continued, exanthematous and malignant, the functions of the spinal chord are more or less impaired or disturbed, as evinced by the pains in the back, loins, and limbs, and by incapability of assuming the erect posture, or even of moving. In the early stages of these maladies, these symptoms are manifestly due chiefly to congestion of the veins and venous sinuses of the vertebral canal, and to disordered circulation in the chord and its membranes; but, at more advanced stages, the morbid or contaminated state of the blood itself, and the failure of vital power generally, still further increase the deficiency of voluntary motive power, paralysing not only the limbs, but affecting more or less, through the medium of the branches of spinal nerves communicating with the ganglial and visceral nerves, the functions of the several internal organs, and especially of the urinary and genital.

4. *b. Rheumatism* and *gout*, the former especially, may attack, by metastasis or otherwise, the membranes of the spinal chord, and by the effusion of lymph between them greatly impair or entirely abolish either motion or sensation, or both, in parts supplied with nerves from or below the seat of effusion. A similar succession of disease may occur in the course of various acute eruptive maladies, although much more rarely.

5. *c. Scrofula, tubercles,* and *rickets* very frequently attack the spinal column, generally the bodies of the vertebræ, and produce the most serious effects not only upon these, but not infrequently also upon the membranes, the spinal chord itself and the roots of the spinal nerves, causing the several sympathetic disorders which will be described in the sequel. The affection of the spine may, in scrofulous subjects, be the only serious manifestation of the scrofulous taint, or it may be associated with, or consecutive upon, other outbreaks of this taint, in the form of tubercular infiltration or other structural lesions.

6. *d.* The affection of the spinal chord and membranes may be connected with *disorder of the sexual and urinary organs*; and, although the more severe affections of the former generally disturb or abolish the functions of the latter, serious or protracted disorders of the urinary and sexual organs not infrequently excite important lesions of the spinal chord. This latter procession of morbid phenomena admits of ready explanation. Exhausting seminal and other discharges from the genitals depress vital power generally, impair the requisite nutrition, and regeneration of the nervous influence of the chord; and thereby not merely weaken remarkably the functions of this organ, but affect its intimate organization, favouring softening or other structural change. Irritation also of the sexual organs, and of the urinary organs also, may be propagated by the communicating branches of nerves to the spinal chord, and, when thus extended and perpetuated by a continuance of the cause of irritation, serious lesions may be reasonably inferred to arise not only in the chord itself, but also in its several envelopes, and even in the bloodvessels lodged between these envelopes and the bodies of the vertebræ.

7. *e. Inflammatory affections of the nerves*, especially of those of the lower limbs, may extend even to the spinal chord or membranes, and produce in these similar changes to those which follow the metastasis of rheumatism or gout to these structures, or the suppression of eruptions, &c. This succession or extension of disease is rare, but a few instances have come under my observation, especially the extension of inflammatory sciatica to the sacrum and back, and the supervention of spasms, followed by loss of motion, &c.

8. *B. There are various symptoms, circumstances and complaints, several of them appearing obscure or anomalous, which ought to direct our attention to the spinal column, and lead to a very careful examination of its state and functions.* — *a.* The *voice* and *respiration* are often affected when the upper portion of the medulla or chord is in any way implicated in disease. I saw some years ago a gentleman who had been seized when a young man with hemiplegia, the speech, tongue, and muscles of the face having been affected. He was subsequently quite restored to health, and presented no indication of paralytic affection, and had for many years pursued his profession. But on the last occasion of his consulting me he complained of a form of hoarseness, or state of voice, which had been treated by more than one physician as a chronic laryngitis. I had arrived at first at the same conclusion; but an examination of the chest, throat, and neck, attention to his arti-

culation and voice, and the previous history of the case, convinced me, that the affection was more paralytic than inflammatory, and that he was in imminent danger of an attack of asphyxia, of apoplexy, or general paralysis, from lesions about the medulla or base of the brain. The treatment was directed accordingly; a seton was placed in the nape, but he died suddenly some time afterwards. The affection of the functions of respiration, and even of the actions of the diaphragm consequent upon disease of the medulla, or of its envelopes, was known to Galen.

9. *b.* Since the days of Galen (*De Locis affectis*, l. iii. c. 10.), the influence of the medulla oblongata and spinal chord upon respiration and the actions of the *heart* was overlooked until Vernay, Morgagni, Eller, Zinn, Le Gallois, Prochaska, Brodie, and more recently W. Phillip, C. Bell, and M. Hall, directed especial attention to the subject. The last-named writers, however, imputed the action of the heart entirely or almost wholly to the nervous influence of the medulla, overlooked the more important influence of the organic or ganglial nerves abundantly supplied to the heart and respiratory organs, and directed their attention chiefly to, and over-estimated, the spinal nervous influence, which only reinforces and modifies the more important and greater — the more vital power—which the heart and lungs receive from the other source just named. There is no doubt that the mechanism of respiration — the respiratory muscles, are more especially influenced and actuated by the medulla and chord; and that whatever interrupts or intercepts the nervous influence from these sources, or from the more basilar and central parts of the brain, by causing asphyxia, soon arrests the actions of the heart. That the contractions of the heart may be rendered more energetic, more tumultuous or impulsive, either by mental emotion, or by irritation of the sources of nervous influence now named; or, on the other hand, that these contractions may become more slow, more weak, and even more irregular and intermittent, until death may supervene with more or less rapidity, owing to a defective or an interrupted, or an intercepted transmission of nervous influence from these sources, cannot be disputed. In cases, therefore, which present disordered action of the heart, of whatever kind, not only should this organ itself be carefully examined, but also the state of the spine, as far as that may be done, and the several manifestations of organic nervous influence, as displayed by the several digestive, assimilating, and excreting functions.

10. *c.* The abdominal muscles are subject not merely to *cramps* and *spasms* when the medulla spinalis or its membranes are diseased, but, even independently of cramps, the patient often complains of a remarkable increase of the sensibility of the cutaneous surface, of a sensation of girding or *constriction* around the abdomen or base of the thorax, subsequently of impaired sensation and motion, with great constipation of the bowels, retention of urine, and various other symptoms, according to the portion of the chord which is implicated. (See art. Paralysis.)

11. *d.* The limbs are often the subjects of *cramps*, or permanent *contractions*, often with an intervening sensation of *prickings*, numbness, and peculiar modifications of sensibility, especially near the points of the toes or fingers, with a sense of weight and numbness of the legs and feet, or of the whole limb. Occasionally these sensations are felt on one side only, or in both, or more severely in one than in the other; and, although they often precede an attack of gout, they frequently are precursors of organic lesions of the chord or its membranes, and thus usher in an attack of paraplegia, or inflammation of the chord and its membranes, or accompany inflammation of the intervertebral cartilages, or caries of the bodies of the vertebræ.

12. *e.* More or less *severe pain* or *neuralgia* may be complained of, in some remote part from the spine, or in one or more limbs, often in the extremities, but as frequently deep-seated in the middle of the thighs, or in the abdominal muscles, or between the ribs, the pain often admitting of being traced to the origin of the affected nerve in the spine. The effect of position upon the pains—of standing, or sitting, or lying down in the prone or in the supine position; and the periods of the day or night when they are most acute, ought to be carefully ascertained. In cases of inflammation of the chord, or of its membranes, or of the bodies of the vertebræ, the pain is much increased towards morning and after lying upon the back, and extend around the abdomen and down the limbs, with at first retention of urine, constipation, and subsequently loss of power of the sphincters. If, however, the inflammation be slight, and the patient has not retained the supine posture during the night, the pain may be diminished in the morning, owing to augmented capacity, by elongation, of the spinal canal.

13. *f.* The state of the *sexual functions* are often much disordered in diseases or injuries of the spine or of the chord. Whilst masturbation, or sexual intercourse, when excessive, may impair the nutrition of the chord, and induce disease both of it and its membranes, the latter occasions, particularly when the lesion is low in the chord, loss of sexual power, and incontinence of urine. Injuries or acute disease in the cervical portion of the chord are often attended by priapism.

14. *g.* The above and other phenomena, which will attract the attention of the observing physician, will always suggest to him the necessity of having recourse to a careful examination of the spine; and even when none of the above is present, the patient, however, presenting unusual debility, or impairment of activity or motion in the lower extremities, or great weakness or trembling of the knees, with a bent, staggering, or unsteady mode of progression, emaciation of the lower extremities, relaxation of the ligaments of the joints, &c., the experienced observer will infer impaired nutrition and function of the spinal chord, either from the exhaustion produced by masturbation or excessive sexual indulgence, or from congestion of the venous sinuses of the vertebral canal, or from incipient softening or other structural change in the chord, or in its membranes.

15. *h. An examination of the spinal chord* should be commenced with a careful inspection of it in various positions — whilst standing erect, whilst the trunk is bent to either side, and when the patient is prone. The effect of bending or turning quickly to either side should be observed; for, even in incipient caries of one or more bodies of the vertebræ, the patient sometimes experiences a

sensation, grating, or crepitation, on making any of those changes of position. The sensibility of the surface of the trunk and limbs, the temperature and state of the skin, and the degree of rapidity with which volition is conveyed to the extremities ought to be noted. The clavicles, the ribs, the sacrum, the crests of the ilia and hips, should also be noticed, in respect of their particular states, and of their relations to the spine; for by their aid, relative position, and direction, incipient states of curvature may be ascertained. The effects of pressure and of percussion over the spinous process of each vertebra, and over the outlets of the spinal nerves, should be carefully observed. It has been supposed that the pressure of a hot sponge directed over the vertebræ will detect subjacent lesion, and point to its exact seat when other modes of having recourse to pressure will fail. I have not observed much advantage from this mode of examination, but it need not be neglected; inasmuch as the more fussy and the more particular, and the more singular the mode and means of examination resorted to, even when the nature of the case is as clear as sunshine, the more they will attract the observers, both interested and disinterested, and accord with the prevailing ad captandum minuteness and professional manipulations of the day. If there be no occasion for a graceful display of the stethoscope—and when may not such be necessary, or made apparently requisite? And if there be no requirement for the introduction of the speculum — and when, indeed, should the phalloid instrument be neglected, if the patient be a female!—let us by all means have recourse to some other medium of communication between the patient and doctor — some new instrument of legitimate medical charlatanry—that may strike, if not amuse or gratify, the former, and recommend the latter. How is it that, amid the remarkable number of spine-doctors and writers on spinal curvatures for the benefit of a discerning public, no one has invented a pocket instrument for examining and straightening the spine? Or, has one been actually invented, but, having been always applied *a posteriore*, no one besides the inventor and manipulator has yet been able to detect the excellence or penetrate the mysteries of the invention?

16. II. The Causes of diseases of the Spinal Column, Membranes, and Chord, are generally sufficiently manifest; but they are occasionally more or less obscure, especially as regards the extent of their individual influences. As the causes of disease of the several structures composing the spine are almost common to each variety or form of malady to which these structures are liable, although certain of the causes affect one tissue in preference to the others, I shall, therefore, devote a due consideration to all of them, with such notices of their effects as may best subserve practical purposes.

17. *A. Improper physical education and clothing* comprise a great variety of circumstances and causes productive of curvatures, and even of more acute disease of the spinal column; and, although this class of causes operate chiefly in childhood and early life, yet their effects often continue until old age, and are rendered more severe and irremediable by the regimen and clothing adopted during puberty and adult age. In this climate more especially, the frequent and sudden vicissitudes of temperature and humidity require that the body—both trunk and extremities—should be covered in such a manner as to preserve the surface in a sufficiently warm and perspirable state, avoiding any excess or extreme of cold or warmth, and to allow a free and easy exercise of all the muscles of the extremities and trunk. Thus clothed, and avoiding all cinctures or corsets, or other baneful contrivances introduced by ignorant dogmatisers, from the period of infancy upwards; exercise in the open air and in sunshine; sufficient but not immoderate or improper food, are the means which will best ward off affections of the spine, and in proportion as either of these is neglected, so will a predisposition to these affections be generated.

18. The use of stays or corsets of any kind during childhood, and exposure of the joints to cold, are amongst the greatest evils to which the human race is liable. The former embarrasses and limits the actions of the dorsal and lumbar muscles, and of all the muscles of the trunk, weakens and relaxes the vertebral ligaments, and whilst it favours unnatural curvatures, endangers more or less the important parts lodged in the vertebral canal: the latter weakens and enlarges the joints, and depresses vital power. The want of due air and proper exercise from the age of five years to twenty; the mental cramming pursued during the greater part of that time; the prolonged periods of study in a crowded and insufficiently ventilated apartment; sleeping in a self-contaminated air, and in chambers overcrowded or too small for the number of occupants; insufficient, or unwholesome or incongruous food, are very generally associated causes of the delicacy of constitution, of the weak or imperfect development of muscle, and of the relaxation of ligaments, which both predispose to, and even directly occasion, spinal curvatures and disease. The vice of self-pollution, moreover, which is apt to spring up and diffuse itself in young persons about the age of puberty, when they live in considerable numbers under one roof, remarkably aid these causes in developing their effects upon the nervous system and spinal column; but to this most important agency more particular attention will be paid in the sequel.

19. In connexion with the use of stays, the usual mode of their construction requires some notice. Whilst they are so made as to press downwards and together the lower ribs, to reduce the cavity of the chest, especially at its base, to press injuriously upon the heart, lungs, liver, stomach, and colon, and even partially to displace these vital organs, they leave the upper regions of the chest exposed—those very regions where tubercular, consumptive, bronchial, and inflammatory diseases generally commence, or are the most prone to attack—to the vicissitudes of season, weather, temperature, humidity, and external injury. These noxious and unnecessary articles of clothing — these mischievous appliances to the female form, useful only to conceal defects and make up deficiencies in appearance, are rendered still more injurious by the number of unyielding, or only partially yielding, supports with which they are constructed on every side. There are the whalebones in the back and sides, and the steel in front, extending from nearly the top of the sternum almost to the pubes. The motions of the trunk and

spine are thereby restrained, and the nutrition of the compressed parts impaired; but, irrespective of the displacement of vital and assimilative viscera that follows the amount of pressure, the metal support in front has an injurious effect, which has been universally overlooked. However well it may be protected from contact with the surface, it acts as a conductor both of animal warmth, and of the electro-motive agency passing through the frame: it carries off by its polarization, into the surrounding air, especially during humid states of the atmosphere, the electricity of the body, this agent being necessary to the due discharge of the nervous functions, either in its electro-galvanic, or magneto-electric, state or manifestation. The injurious influence of stays on the female economy, as respects not only the diseases of the spinal column, but also the disorders of the uterine organs, is manifest to all who consider the subject, and has been ably discussed in a work by Mr. WHITFELD of Ashford, to which I refer the reader.

20. B. *Constitutional vice and diathesis* especially favour the occurrence of, and even directly occasion, diseases of the spinal column. Of these the most influential are the scrofulous, the rheumatic, and the cancerous. Scrofula, either latent or developed — whether concealed or tuberculous — often produces disease of the bodies of the vertebræ, either in the form of scrofulous inflammation of them, or by infiltrating their cancellated structure with tubercular matter. The *causes of scrofula*, fully discussed in another place (see *art.* SCROFULA, §§ 13. *et seq.*), have in many instances the effect of developing disease of the spine without having previously changed the diathesis or habit of body, at least in an obvious manner. In such cases, they are often only predisponents to such disease, some other agencies exciting it. Whilst scrofula chiefly causes disease of the vertebræ, the rheumatic diathesis, or pre-existing rheumatism, favours the occurrence of rheumatic inflammation of the ligaments of the spine, or rather of the sheath and membranes of the chord. Inflammation of these tissues may appear either as a metastasis of the rheumatic attack, or primarily upon exposure to cold or wet, or to currents of cold air in this quarter. The gouty diathesis is not so frequently a cause of spinal affections as rheumatism; but congestion of the venous sinuses of the spinal canal, causing pain in the back and loins, and feebleness of the lower extremities, is a frequent complaint in gouty persons. The cancerous diathesis has probably little influence in the production of spinal complaints, although the several varieties of cancerous disease have been occasionally found to implicate one or more of the spinal structures. Children, whose parents are aged or debilitated, and whose conformation is originally weak; the progeny also of the dissipated, the drunken, or the exhausted by syphilis, mercurial courses, or cachectic affections; a rapid or premature growth, and children brought up by hand, or living in large towns without the advantage of occasional change of air; are much more liable to spinal affections, than others differently circumstanced, as they advance in growth or age.

21. C. *Certain previous maladies*, especially those above-mentioned, exanthematous and malignant fevers, more particularly scarlet fever, the syphilitic cachexia, tuberculous disease, sexual and urinary affections, particularly in the female, aneurisms of the aorta, and internal tumours and abscesses, either favour the development or excite disease of the spine, or of its contents. Aneurisms of the aorta, and internal tumours and abscesses in some instances, by their size and pressure, occasion erosion or ulceration of the bodies of the vertebræ. Flexures of the spine and disease of the vertebræ frequently follow the more severe attacks of the exanthemata; and tuberculous disease with caries of the vertebræ, sometimes followed by abscess, is frequent not only in the scrofulous diathesis, but after tuberculous affections have been developed in the lungs, mesenteric glands, or in other parts.

22. Uterine irritation and excitement, and the several forms of hysteria, and their numerous manifestations and alliances, are often followed by congestion of the venous sinuses of the vertebral canal; by what has usually been called spinal irritation, or inflammatory congestion or irritation of the chord and its membranes; and by flexures of the spine or structural change of the contents of the column. Frequent sexual excitement and consequent exhaustion, alternating with unnatural rapidity, are the most frequent causes not only of these uterine and hysterical disorders, but also of the allied affections of the spine and its contents: and, although the one class of disorders is generally consecutive of the other, the spinal diseases with their several sympathies more commonly following the sexual, the former may be primarily manifested, especially in the male sex; masturbation about the period of puberty, and premature or excessive sexual indulgences, being the most common causes of chronic disease, the most injurious of vices, mentally and physically, and, whilst they most powerfully predispose to, they directly occasion, especially in weak constitutions, and when aided by other causes, one or other of the more serious maladies of the spine and its contents. (See *art.* POLLUTION.)

23. D. *The influence of physical agents*, especially of cold, currents of cold air, unusual increase of temperature, more particularly if these be applied to the back; sleeping in damp beds or upon the ground, or in the open air, with exposure of the back; sitting in wet or damp clothes; exposure of the back or loins to much heat, especially during dinner; sudden suppression of the perspiration by exposure to cold or to cold air, as when a person is called out of a warm bed. A medical man was called out of bed when perspiring freely, and got into an open carriage insufficiently protected, during a cold night. He was soon afterwards seized with inflammation of the membranes of the spinal chord. I attended him with other physicians. A corpulent female of middle age slept with her back to a window which had been left partially open. She complained of chills, pains, and rigors, during two or three following days, subsequently of acute pain in the loins, pain, numbness, and cramps in the lower extremities, and other symptoms of inflammation of the spinal membranes. She afterwards became paraplegic. A gentleman from Jamaica, after a hot day, fell asleep at night on the deck of the ship in which he was making his passage to Europe. He awakened cold, shivering, and benumbed, and was soon afterwards generally pa-

ralysed. A gentleman dined at a party where he was a stranger, and did not complain of the heat of the fire at his back. The following day and the next he had frequent vomitings, violent pain in the back and loins, numbness, pain, and cramps in the legs, obstinate constipation and retention of urine, followed by paraplegia. I could adduce numerous instances similar to the above which have occurred to me during a practice of upwards of thirty years. The causes which I have mentioned under this head, as well as those which follow the next to them, generally affect primarily or chiefly the membranes of the spinal chord, the affection of these and its consequences generally implicating more or less the chord itself and the origins or roots of the spinal nerves.

24. *E. The metastasis and suppression of external disease or accustomed discharges* have been partially noticed above. During an early period of my practice, I observed several cases of this occurrence, chiefly at the institutions to which I was physician. In one case of metastasis of rheumatism to the spinal membranes which I treated in 1820, general palsy supervened, and I had an opportunity of minutely examining the spine and its contents after death (*see Lond. Med. Repos.*, vol. xv.). Since that period similar cases have come under my observation, which have terminated either in paraplegia, or in general palsy and death. Suppression of the catamenia, the stoppage of profuse leucorrhœa and of hæmorrhoids, the drying up of accustomed discharges, the healing of chronic ulcers and cutaneous eruptions, have severally been followed by disease of the spinal contents. In many of such cases the blood has been more or less impure—has been insufficiently depurated by the several emunctories; and when the manifestations of this morbid condition have been suppressed in quarters which served as safety valves from more dangerous consequences, they have broken out in other surfaces and parts, and been followed by much more serious results; and although the spinal membranes and chord may not be frequently thus consecutively assailed, yet they are occasionally, when the suppression of the primary disease has taken place before the blood has undergone depuration by an increased action of the excreting organs. We frequently observe surgeons endeavouring to cure eruptions, ulcers, chronic discharges, &c., by lotions, ointments, cerates, and other appliances, either unsuccessfully or with the contingent result of consecutive internal disease when they succeed; whereas, a decided action on the several excreting organs, by appropriate means, by removing effete or injurious elements and materials from the blood,—by counteracting or eliminating those irritating and self-contaminating matters perpetuating or causing the primary disease,—would most speedily and effectually remove it, and prevent any subsequent risk from metastasis or other morbid manifestation.

25. *F. External injuries* are amongst the most common causes of disease of the spine, or of its contents. These injuries may be so slight as to be overlooked or forgotten, their effects being developed slowly and insidiously until they arrive at a pitch which alarms either the patient or his medical attendant. The more severe injuries by which a vertebra is broken, or its intervertebral cartilages torn, or ligaments or muscles ruptured, and the chord or its membranes either more or less injured at the same time, or consecutively affected by inflammation, effusion, &c., readily account for the great extent and danger of the effects produced. But there are slighter injuries, which sometimes slowly, and after a protracted period, occasion no less serious results. A slight fall on the back, as on descending a stair, or a fall backwards, when the back, or even the os coccygis, strikes against a hard or sharp substance, is sometimes followed, if due care be not taken, by serious effects—by inflammation of the membranes of the chord, or even of the chord itself, and, if not rationally treated, and even when so treated in faulty constitutions, and if a proper regimen be not adopted, by paraplegia, often passing on to general paralysis, and ultimately terminating in coma and death.

26. Concussions of the spine occasioned by falls, or by leaping from great heights or other modes, are frequently followed by effects usually produced by the most severe injuries of the column, even although no fracture, rupture, or dislocation can be traced. The vertebræ and intervertebral cartilages may nevertheless have sustained some injury, and the minute organization of the chord and the origins of the nerves may have been ruptured or injured so as to escape detection after death upon a superficial inspection. In these cases, the severity of the effects will lead to a due appreciation of the importance of the cause. But a slight effect should not be unheeded; and even the most trivial symptom, apparently to the uninstructed or inexperienced, ought to attract to itself marked attention and care. Several instances have come under my care where the most dangerous and even hopeless consequences have followed the slightest falls and concussion, the more immediate effects having failed to attract the attention or care of the sufferer.

27. Amongst the less marked causes of disease of the spine or of its contents, although occasionally productive of the most important results, are muscular efforts in lifting heavy bodies, or similar efforts made suddenly or irregularly, and when volition is not duly exerted, or is directed also in a different direction. Rapid movements, torsions or bendings of the spine; undue pressure made upon one side of the vertebral bodies, by unnatural positions retained for a long time; frequent rotations of the column, and reaching to objects too high or too low, are occasionally productive of injurious effects. The most fatal injury may even follow a common or slight effort. A strong muscular man broke the second vertebra of the neck completely across on both sides when pressing his head on the pillow as a fulcrum to enable him to turn in bed, and the nature and extent of the injury were ascertained after death by Professor Quain and myself.

28. Curvatures of the spine often result from assuming the same position on frequent occasions —by sleeping on a high pillow on the same side, by improper postures in writing, playing on the harp or guitar, by drawing, by carrying a weight or burden on the same arm, as in nursing, and by always using one hand more than the other. Riding on horseback produces most injurious physical and moral effects on females: it gives the spine a certain degree of twist; and the concussions im-

parted to the nates, pelvis, and trunk, occasions a degree of excitement followed by exhaustion, which, if not amounting, often leads on, to self-pollution. To these apparently slight causes, especially to their continuance, the lateral curvatures of the spine, so very frequent in females, are in great measure to be attributed.

29. III. Curvatures of the Spinal Column, — Flexures of the Spine, — Lateral Curvatures of the Spine,—*Lateral Deflections of the Vertebral Column*; — *Unnatural Deviations of the Spine.—Distortions of the Spine.* — *Functional Curvatures of the Spine.*

30. Classif.—I. Class. IV. Order (*Author in Preface*).

31. Definit.— *Unnatural curvatures of the vertebral column, occurring from other causes than from structural changes of the bodies of the vertebræ.*

32. Curvatures of the spine, produced otherwise than by caries or anchylosis of the vertebræ, may be divided into three *varieties or forms*, namely, *posterior curvature*, or excurvation, the convexity being directed backwards or outwards; —*anterior curvature*, or incurvation, the convexity being inwards or anteriorly;—and *lateral curvature*, the convexity being to either side, generally the right, and, when considerable, being either double or complicated. The angular projections occasioned by caries or anchylosis of the bodies of the vertebræ are altogether different in their natures from these curvatures, and fall under a different category of lesions.

33. i. Posterior Curvature of the Spine, — *Excurvation*, — *Cyphosis*, — affects chiefly the dorsal and cervical portions of the spine, and only occasionally extends to the upper lumbar vertebræ. It is often caused in infancy by the common practice of raising the child by the open hands placed under the arm-pits, whereby the ribs are pressed inwards, and the spine and sternum are pushed outwards, as described when treating of *deformities of the chest* (see *Art.* Chest, §§ 2. *et seq.*), where the causes producing it are fully stated. Slighter forms of this curvature occur in young persons, and in adults, owing to shortness of sight and the habit of stooping, and holding the head near objects when reading, writing, or working; and in aged persons from diminished thickness and elasticity of the intervertebral cartilages, and in these the curvature extends lower in the spine. When the curvature is considerable, the anterior portion of the ring or body of each vertebra is rendered somewhat thinner or more flattened, especially in the centre of the curvature, —and, as a necessary consequence, the transverse processes, and still more so the spinous processes, are more separated. The ligaments are also affected, the posterior being more or less stretched. When the ribs are laterally compressed, so as to diminish the diameter of the chest from right to left, the sternum is pushed outwards, assuming a similar position to the dorsal spine. In other cases, the sternum follows the direction of the dorsal vertebræ, the ribs being curved outwards, and the diameter of the thorax being lessened between the spine and sternum. If the excurvation implicate the lumbar vertebræ, the angle formed by this part of the spine with the direction of the sacrum or pelvis is lost, and the brim of the pelvis becomes horizontal, the spine and the direction of the pelvis being in nearly the same axis. In excurvations of the spine, the capacity of the thoracic and abdominal cavities, and the position of the viscera, are more or less affected, the former being diminished, the latter being somewhat changed or embarrassed.

34. ii. Anterior Curvature, — *Incurvation of the spine*, — *Lordosis*. — This form of spinal curvature is most rare. It is most frequently met with in a slight form in the lumbar vertebræ, and is then merely an exaggerated state of the curvature natural to this part of the spine, and is seen not infrequently in persons who, in early life, have brought their lumbar muscles into very active use. In other circumstances, however, it is occasionally observed giving the abdomen unusual prominence, and, when seated near the pelvis in females, presenting the appearance of pregnancy or of ovarian disease. When this curvature affects the dorsal vertebræ, it occasions marked deformity of the chest: the posterior angles of the ribs pass outwards and backwards from the spine, and the antero-posterior diameter of the thorax is diminished, unless, indeed, the sternum be also pushed forwards, which is rarely the case. When the anterior curvature is seated so low down in the lumbar region as to form an angle with the sacrum, the effect in females during parturition may be serious, as it is frequently connected with a diminished antero-posterior diameter of the brim of the pelvis.

35. This form of curvature may arise from an increased force, or more frequent and developed action, of the dorsal or lumbar extensor muscles, relatively to the vital tone or cohesion of the anterior ligaments of the spine, and to the action of the recti abdominal muscles; and it may be associated with some constitutional taint or disease, as with scrofula, rickets, syphilis, or some cachectic condition, &c. When it is connected with rickets, it is most apt to occur during convalescence from this malady.

36. iii. Lateral Curvature. — *Lateral deflections of the spine*,—*Scoliosis*.—This is by far the most common form of spinal curvature; and generally appears between the ages of 10 and 18, although it may commence either earlier or later. It is most common in the upper and middle classes, and comparatively rare in the lower or harder working orders. Owing to the position of the viscera—to the heart on the left, and the liver on the right, it has been supposed that there is always a tendency to a double lateral curvature of the spine, especially in lymphatic, weakly constituted, and cachectic persons. There can be no doubt that, whatever influence may be produced by this circumstance, it is really so small as not to deserve consideration. The upper lateral curvature has generally its convexity to the left, is small, and comprises the lower cervical vertebræ with two or three dorsal vertebræ. The second or middle curvature is the most remarkable; has generally its convexity to the right, and is formed by the dorsal vertebræ. The third or lower curvature has its convexity to the left, and comprises the lumbar, and lowest dorsal vertebræ. The first or upper curvature may be very slight or altogether wanting, although the second or dorsal is considerable; but, in this case, this latter extends higher, and the third or lumbar is also considerable. Either the dorsal or lumbar may

be the most marked, more frequently the former, which, in some instances, may appear the chief or only one.

37. Lateral curvatures may be very slight, or they may be very great: they are seldom completely lateral, but are commonly conjoined with more or less posterior curvature. It is manifest that, when the deflections of the column are very considerable, the natural rotation of each vertebra on the other must be diminished or limited in the curvatures, and that it must take place chiefly between them, or between those vertebræ which remain the nearest to the natural axis of the trunk. The sides of the bodies of the vertebræ must also experience greater pressure towards the centres of the concavities and diminished pressure at their convexities: hence will result compression of the more yielding tissues and impaired rotation at the more flexed situations. The intervertebral tissues are first compressed in the sides, which are concave, and afterwards thinned. The bodies of the vertebræ are also more or less affected, and atrophied in these sides, and assume somewhat of a rhomboidal form. The articulating processes are much altered in the situations where the curvatures are greatest: they are atrophied, nearly obliterated, and absorbed in the concavities; and rendered more prominent, the spinous processes being also more protruded, in the convexities.

38. When lateral curvatures are very great, the effects become still more serious. The passages between the vertebræ for the nerves and bloodvessels are straitened and almost obliterated in the concave side, and enlarged and elongated in the convex. The consequences of the constriction of these outlets must be evident in respect of both nerves and bloodvessels. They were pointed out by Morgagni and Portal, and more recently insisted upon by Chailly and Duges. The pressure, also, on the sides of the vertebræ sometimes causes partial absorption or caries of the part which suffers the most from it; and, in these situations, or where the concavity is greatest, ossific deposits are there formed, producing partial or lateral anchylosis, sometimes extending to the lateral, transverse, or oblique processes of articulation, and furnishing support to the most affected and weakened part of the spine. In these situations the ossific formation results from a state of chronic inflammation which is productive of this work of reparation.

39. The *consequences* of extreme or even of considerable lateral curvatures are often very serious. The patient is liable to severe pains, cramps, numbness, and impaired action of the muscles supplied by nerves issuing from the concave side of the spine, when the passages for the nerves and bloodvessels are narrowed. Emaciation frequently follows; and owing to the falling inwards and approximation of the ribs on the concave side of the curvature, and to the bulging outwards of those on the convex side, the cavities of the chest and abdomen are rendered more or less irregular or unsymmetrical, and are also much encroached on; the viscera, especially the lungs and heart, and even the liver, kidneys, and alimentary canal, are embarrassed or impeded in their functions; difficulty of breathing, amounting sometimes to orthopnœa, and palpitation, or slowness, or irregularity of the pulse often occurring, with a feeling of incapability of raising the ribs, or of taking a full inspiration, especially on the concave side. Frequently the viscera accommodate themselves to their unnatural position, when the curvatures increase gradually, and comparatively little inconvenience is experienced unless upon increased exertion; but, when these viscera, particularly the heart or lungs, are attacked by disease, to the causes of which their physical and vital conditions render them most susceptible, then the consequences are much more serious than when these organs are attacked in different circumstances.

40. It is very rare for the spinal chord or its membranes to experience much disorder during lateral curvature, unless the bodies of the vertebræ at the place of greatest concavity become inflamed or carious; but, when either of these results ensues, chronic inflammations, effusions, and organic changes occasionally supervene, in the parts contained by the diseased vertebræ, and the usual effects, namely, severe pain, spasms, and contractions of the muscles of the trunk and extremities and loss of motion, with or without loss of sensation, generally take place. The disease of these structures sometimes extends until the greater part of the spinal contents is invaded, and even until inflammatory action reaches the membranes of the brain, and occasions effusion within the cranium, coma, and death.

41. When the deviation is great, deformity is manifest as regards the position of the shoulder-blades, the collar-bones, and the pelvis. The muscles are also affected, those which are the least used becoming pale and atrophied; and the ribs are also more or less distorted, those on the concave side not merely being closely approximated, but, in old and extreme cases, becoming partially anchylosed. The chief curvature implicating the dorsal spine commonly presents its convexity to the right, pushing outwards the shoulder-blade, and causing the left shoulder-blade to fall inwards. When the chief curvature is in the lumbar region, it is generally directed to the left, and more or less posteriorly, the bodies of the vertebræ being considerably changed (§ 37.), and sometimes becoming even disorganised.

42. *The progress* of spinal curvatures is extremely variable. They sometimes proceed slowly and insensibly; occasionally rapidly. They have been said sometimes to occur suddenly and unexpectedly after a first confinement, and increase remarkably. It may be suspected that in such cases, the curvature had existed previously, but had been concealed by the dress; the puerperal states and lactation merely augmenting the deformity. Curvatures may proceed to a certain extent, and become stationary ever afterwards; or they may, upon the removal of the causes, and by proper means, be in great measure remedied. When neglected, they may be increased so as to bend the patient forwards or to either side, in a most surprising manner, the arm-pit almost reaching the hip-joint.

43. iv. The Prognosis of Curvatures depends chiefly upon their extent, and upon the effect produced upon the spinal contents, upon the spinal nerves, and upon the viscera of the chest and abdomen. The curvature may be very great, and yet, as long as neither spasms, nor paralysis, nor marked embarrassment of the functions of vital or internal organs, nor other serious disorders,

supervene, reasonable hopes may be entertained of an advanced age being reached. The appearance of such disorder, as a manifest consequence of curvature, should suggest an unfavourable prognosis; the danger having stricter reference to the nature and extent of the consecutive disturbance, than to the amount of curvature. The removal of old curvatures is seldom attained with complete success; and, unless with the view of alleviating serious disorder occasioned by them, should not be rashly attempted; for adhesions, adaptations of parts, ossific formations even, and other alterations, may have taken place, that may not be disturbed, without occasioning more serious disturbance.

44. v. The Causes which more especially occasion curvatures of the spine are the female sex; the age between 9 and 18; a lymphatic, scrofulous, or ricketty constitution; an originally weak conformation of frame; an exhausted, feeble, or cachectic habit of body; insufficient food, living in low, humid, and close situations, and all the causes productive of scrofula; convalescence from acute and chronic maladies; want of pure air, light, and sunshine; a premature and rapid growth; defective or improper exercise; crowded and close apartments during night and day; the continuance of mal-positions; the too exclusive use of the right hand and arm; the use of stays and metal or other supports, and self-pollution. Mayow attributed curvatures to a want of harmony between the development of the vertebral column and that of the muscles; and Morgagni, Méry, and more recently Guérin, believed that they are often caused by contraction of the muscles consequent upon disease of the nervous centres. Mayow's hypothesis is incapable of support; the opinion of Morgagni is more deserving of attention, and may be admitted to be just in some instances.

45. vi. The Treatment of Spinal Curvatures, as promulgated to the public in recent times, would, in the hands of a Molière, furnish a most bitter satire on medical practice:—so many writers, and so much said, and yet so little information furnished,—each successive author depreciating the means advised by his predecessors, and yet adding nothing to what was already known,—every new spine-doctor having his own apparatus, instrument, or couch to recommend and to sell, either or both being said to be capable of curing cases which were heretofore incurable, —the parading of casts of deformed trunks, rendered as symmetrical as the statues of antiquity by the newly discovered or peculiar method of treatment —the publication of books, containing merely exaggerated accounts of successful cases, without even, as in some of these publications, any notice of the methods employed,—the promulgation of opinions opposed to anatomical and physical truths to subserve delusion,—and large promises, but scanty performances, were amongst some of the means adopted by the majority of those who had chosen this *speciality*, as the best calculated to fulfil the objects of their professional mission. But it may be as well to take a brief view of the methods lately promulgated, and of the progress made (?) in this department of medical practice.

46. Mr. Baynton, in 1813, advocated rest for a long time in the horizontal position, on a specially constructed couch, but furnished no particulars of treatment.—Mr. Sheldrake in 1816, recommended an instrument of his own to support the weight of the head; and extension on an inclined plane, &c.—Mr. Wilson, in 1820, advocated chiefly muscular exercise directed especially to the dorsal muscles, the horizontal position occasionally; and he justly condemned all instruments which are made to act from the pelvis upwards, and which were then much in vogue among distorsion-curers.—Dr. Jarrold, in 1823, considered curvatures to depend upon constitutional causes, treated them accordingly, and prescribed chiefly muscular exercises, burnt sponge and carbonate of soda internally.—Mr. Bampfield, in 1824, advised muscular exercises, extension of the spine by pulling the legs and arms, frictions and shampooings, and the use of instruments to exercise particular parts.—Dr. Dods, in 1824, objected to the inclined plane, to any spinal apparatus, and to the practice of carrying weights upon the head, as directed by some of his predecessors. He employed a concave couch to bend the whole spine forwards, and to relax the spinal muscles. The success of this plan must have been astounding! — Mr. John Shaw, in 1827, resorted to muscular exercises, to supports for the spine, and to extension on a couch of his own contrivance. — Dr. Harrison, after publishing numerous cases of vaunted success, and withholding any account of the means employed, produced, in 1827, a large book, which contained nothing but unsound views, exaggerated accounts, and a mystification as to his method of treatment. This, however, was nothing more than the horizontal position on a fixed mattress, friction, &c. This last he directed by means of assistants in such a manner as to lead his victims to persevere, and to inspire them with hopes which were rarely realised.—Mr. Stafford, in 1832, advised spinal supports, the horizontal position, conjoined with exercises.—Mr. Beale, in 1833, recommended frictions, muscular exercises, mechanical extension, and instruments in certain cases.—Mr. Coulson, in 1839, prescribed suitable exercises, and condemned, with great justice, all kinds of collars, machines, or instruments.—Mr. Ward, in 1840, resorted to the recumbent position, to exercise of the muscles of the spine and head, and objected to mechanical supports.—Mr. Tuson, in 1841, advocated principally the recumbent position on a couch of his own contrivance, that admitted of muscular exercises while recumbent.—Mr. C. R. Harrison, in 1842, published his work to say, that he cured deformities of the spine and chest by exercise alone, and without extension, without pressure,—the means empirically employed by his late namesake,—and without division of muscles — the division of muscles having been then brought into vogue from Germany, the fruitful parent of humbug, for curvatures, for squinting, and for every thing to which credulous fools would submit.—Mr. Hare, in 1844, wrote to recommend his couch, which acted on the spine by extension produced by pulleys and weights.—Mr. Coles, in 1845, praised the prone position, for which he constructed a couch on which the patient reposed upon his chest and abdomen, with exercise of the muscles of the spine and upper extremities.—Mr. Tamplin, in 1846, confided altogether in mechanical support by

means of a steel instrument, which he contrived for this purpose, based, like many of those employed by the instrument makers who had gone before him, to rest upon the pelvis. He condemned the horizontal position and all kinds of couches.—Mr. Lonsdale, who has furnished me, in his work, with a portion of the above information, in 1847, improved greatly on Mr. Tamplin's instrument, adding its best and most original part, and recommended a couch which appears to be the best of all hitherto employed.

47. From this exordium, the reader will perceive the amount of information to be obtained from books, each one of which is written to recommend the practice adopted by its author to the notice of a "discerning public." Physicians are now-a-days allowed to have nothing to say to, far less to do with, this very notable "speciality," or indeed with any complaint, respecting which speciality-doctors have enlisted the "sweet voices" of the public. But physicians will nevertheless look on, and even observe closely the results, note the errors committed, mark the subterfuges resorted to, notice the delusions practised, and remark also the credulity, occasionally interrupted by passing visions of the truth, displayed by the victims during the protracted treatment of a spine-doctor. The study all the while is not without interest to the philosopher: the arts and cunning displayed to conceal expected want of success, and to ensure the faith and perseverance of the patient; the resignation of the latter, and the confident dogmatising of the former; the entire surrender of judgment, liberty, and opinion on the part of the devoted sufferer; the "hoping against hope," and the influence gained over weak minds by the assumed confidence, the decided manner and the repeated promises of the reputed deliverer, furnish food for contemplation and instructive illustrations of the constitution of the human mind. In this way, months, and even years, are passed; the submission and credulity of the one keeping due pace with the domination and perseverance of the other—the hopes entertained by the patient, that future success may ultimately compensate for the losses and sufferings and endurance of the past, protracting still further the period of empirical domination, until at last emancipation arrives; and the patient awakes to her condition, and arises with emaciated muscles, impaired strength, and with loss of the use of her limbs. Nevertheless, she may not confess her delusion. The power which had so long fettered her mind and body retains still a portion of its sway; and whilst she feels the bitterness of her delusion, she has no desire to admit her folly or to confess the full amount of its consequences. She consoles herself with the idea, assiduously inculcated by the persevering attendant, that, without the means of which she has been the victim, the deformity might have been much worse, and with thankfulness for this assurance, she submits to her fate, until another "unfailing method of treatment" excites her attention, when the desire of recovering her shape or of preventing extreme deformity again induces her to enter upon another protracted period of penance, the means being different but the results the same as heretofore.

48. Now, after the numerous repetitions of the means enumerated above,—after the endless variations, modifications, combinations, denunciations, &c. which the very imperfect list just furnished presents—what can I have to recommend, who have seldom had to deal with such cases, unless in rare instances when I have considered it right to interfere to prevent the dangerous consequences which would ensue, or were actually ensuing from a vicious system? What I therefore advise may be briefly enumerated in the following categories:—

49. *A.* To ascertain the several, and especially the chief causes of the curvature, extrinsic or physical, intrinsic or constitutional, mental or moral; to endeavour to estimate correctly their individual influences; and to direct a decisive and scrutinising inspection on their energetically inculcated removal and avoidance. If only one of the causes of mischief continue in operation the best devised treatment may be inefficacious.

50. *B.* To determine accurately the extent and nature of the curvature, the amount of deformity, and the degree in which it has involved the natural positions of the pelvis, shoulders, the clavicles, sternum and ribs; to ascertain in how far the shape and capacity of the thorax and abdomen are affected; to note the states of the digestive, assimilating, and excreting functions; to examine the condition of the muscular and fibrous structures, as manifested by the muscles of the trunk and extremities, and especially by those of the spine, and by the joints; to detect whatever disorder of the thoracic or abdominal organs the curvature may be associated with; to determine the state of the circulation and of the blood as respects the presence of chlorosis, anæmia, or plethora, and to ascertain the conditions of the uterine or sexual organs; and, having acquired all the information that can be obtained respecting these, and having reviewed this information in connexion with what is known as to the causes, to consider well the indications and means of cure which the whole inquiry may suggest.

51. *C.* Having commenced thus carefully, to put these intentions and means into practice, decidedly but cautiously, and in suitable combinations when such are clearly indicated:—(*a*) To pay strict attention to the restoration of the general health—to attend to the digestive and depurating functions, to the advantages of pure air, ventilation, sunshine, and suitable exercise, both before, and during, the employment of other means directed more especially to the removal of the curvature; and at the same time to have recourse to such tonics and restoratives as will promote assimilation.—(*b.*) To have recourse to instruments only when these are imperatively required, and to select such as will admit of the movements of the spinal muscles, and press upon the convexity of the curve.—(*c.*) If couches alone, or in addition to instruments, in the intervals between having recourse to them, or after due exercise, be absolutely required, to select those which furnish pressure chiefly on the convexity of curvature, and liberate the spine from the pressure and warmth of a supine position; and facilitate a recourse to frictions and other means of restoring the tone of the spinal muscles and ligaments. To each of these I would direct a more particular notice.

52. *D. The restoration of the general health* previously to, and during, a recourse to the more empirical and mechanical means adopted by those who take this particular class of affections under

their generous protection, is too generally neglected. Many of the causes most influential in producing curvature act chiefly by impairing the constitutional powers and the general health — by enfeebling the digestive and assimilating functions, by impeding the excreting actions, by relaxing the tone of the nervous and fibrous structures — and hence the importance of the entire removal of these causes, and of the restoration of these functions to health. Of all the causes of curvature, the most frequent, the presence of which it is the most difficult to ascertain, and the most seldom relinquished when so long practised as to produce this effect, is *self-pollution*. Its effects in exhausting organic nervous power, in emaciating the muscles, and in relaxing the ligaments, are much more remarkable than those of any other cause. Attention, therefore, should always be especially directed to its detection and entire relinquishment.

53. Restoration of the vital functions in spinal disorders should be directed not merely to the functions of digestion and excretion, but also to the conditions of the vascular system and of the uterine and urinary functions. If vascular plethora be not present — a condition which is seldom associated with curvatures — the preparations of iron are generally of service, especially if anæmia or chlorosis also exist. If neither of these be present, bitter infusions or decoctions may be first given, and afterwards the tincture of sesquichloride of iron, with or without a little hydrochloric acid, and the infusion or tincture of calumba, may be prescribed accordingly; but, in cases associated with anæmia or chlorosis, the preparations of iron should be adopted forthwith, especially if the urine be alkaline or contain much of the phosphates; and, in these circumstances, the preparation just named and the hydrochloric acid should be employed, and they may likewise be prescribed if the uterine discharge be great, or leucorrhœa be present. In other conditions, or when the catamenial evacuation is insufficient or obstructed, the sulphate of iron, with the aloes and myrrh pill, or the compound mixture of iron, with a sufficient quantity of the compound decoction of aloes to preserve the bowels freely open, will generally prove most beneficial.

54. *E.* Without due *ventilation, light, sunshine, and exercise in the open air*, short of occasioning fatigue, health will neither be restored nor preserved. Large airy sleeping apartments, the light of heaven, and *exercises* of the muscles of the back and extremities, are the most conducive to the prevention of curvatures, and to the restoration of the health of crooked persons. These persons should never ride on horseback, nor even in a carriage, when either can be avoided. Walking is the best exercise, and next to that such exercises as will moderately engage the muscles of the arms, shoulders, and back. Various modes of exercising these muscles have been recently recommended; but, whatever plan be followed, the muscles of both sides ought to be equally exercised. Certain exercises tend more to *prevent* curvature than to remove it; as the skipping-rope, shuttle-cock and battle-door, the use of dumb-bells, and exercises with the rod. The Indian sceptre exercises described by Mr. WALKER, in his work on "*Exercises for Ladies*," are the best adapted to the prevention of curvatures and to the removal of those which are slight. When the curvature is more manifest, or even very great, pulleys should be fixed, at a considerable height above the patient's head, with weights attached to them, great in proportion to her age and strength, and in a situation which will admit of their being pulled in either a forward or backward direction. A stand, also, with a cross bar, or with more bars than one, considerably above the head of the patient, may be erected in a suitable open or airy situation; and, by taking a firm hold with both hands, attempts should be made, gently and cautiously at first, to raise the body by the muscles of the arms and shoulders. When the muscular debility is great, it is generally of great service to have recourse to frictions over the muscles of the spine and back with a warm stimulating liniment or embrocation, for some time previously to adopting these exercises. In 1822 the daughter of a friend had for a very long period been cased in metal instruments, and had suffered in health and strength, without any benefit as to the curvatures. I requested the instruments to be thrown aside, directed frictions to the spine and back, at night and in the morning, with the following liniment, and afterwards a gradual and careful recourse to the exercises just described. The cure was rapid, complete, and permanent.

No. 336. ℞ Balsami Peruviani, et Bals. Tolutani, āā, ʒj.; Olei Terebinthinæ, ℥j.; Linimenti Saponis ℥jss.; Olei Cajuputi ʒjss, Olei Olivæ, ℥jss. vel q. s. ut fiat Linimentum, more dicto utendum.

55. In many cases sponging the back with a strong solution of bay-salt, of a tepid warmth at first, and gradually reducing the temperature subsequently, will be of service, and may be employed once or twice daily. The exercises should be carefully directed, used for short periods only, especially at first, and never so long as to cause fatigue. In the intervals between exercise, the patient should assume the recumbent position — either supine or prone, or upon either side — on a firm horse-hair couch, either horizontal, or very slightly inclined, and with a low pillow. If the patient recline on the side, especially on the right side, or on that which presents the greatest convexity, she ought to place a horse-hair pillow under that part, so as to thrust the convexity towards the true axis of the spine, and retain it in that position as long as she can. Sleeping with too high a pillow, and generally on the same side — most frequently the right — often of itself produces slight curvature. In these cases, a different position should be chosen, the pillow ought to be placed under the side just beneath the arm-pit, when that side is reposed upon, and the patient should be induced to employ the arm and hand of the side on which the dorsal concavity exists.

56. *F. The use of instruments* has been very generally advised by both qualified and unqualified persons. They are required only in the more extreme cases of curvature, and at intervals, or only when it is necessary that the spine should be supported or aided in carrying the weight of the head and shoulders. Mr. LONSDALE's spinal support is the best hitherto constructed, inasmuch as it both supports the weight of the upper parts, and presses the convexity of the curvature inwards, or towards the true axis of the spine. The chief objection to this and all other instruments is the material of which they are constructed; for a broad hoop of iron or steel encircling the pelvis as a basis for support and pressure, and the other

metal parts forming the supports, springs, screws, &c., however well they may be padded, not only hamper or restrain the movements as long as they are applied, but also, and most injuriously, act as conductors of the electricity circulating through and on the surface of the body, conveying it into the atmosphere, especially during warm or humid states. The other instruments, which I have seen, besides those just mentioned, are altogether undeserving any notice.

57. *G. Of couches*, it is unnecessary to say much. A common horizontal couch, firmly made with horse-hair, or one very slightly inclined, is all that is required; but it should be well provided with hair-pillows of different sizes; and, when the patient reclines on the side with the dorsal convexity, a pillow should be placed under it in such a manner as to press it upwards; and when she reclines in any other position as well as in this, the pillow under the head should be low, unless, indeed, she attempts to lie on the side of the dorsal concavity, when it ought to be much higher. I have recommended this use of the pillows of the common sofa or couch for upwards of thirty years in the few occasional cases of curvature, which I have been requested to treat for other ailments; and I believe they are used in a similar manner by Mr. Shaw. In the excellent couch constructed by Mr. Lonsdale, a broad belt passes between supports attached to the sides of the couch, and the patient, when reclining, places the belt under the convexity, and has it drawn upwards; the weight of the body being in great part borne by the belt, which thus presses the convexity upwards. Another couch has been employed by Mr. Coles, for facilitating the prone position and exercise with the arms when this position is retained. It is well adapted to posterior curvature or excurvation of the spine, but it should be used with great caution when this curvature is owing to disease of the bodies of the vertebræ, as will be shown hereafter.

58. IV. Spinal Column—Nervous or Painful Affections of the.—Synon.:—Rachialgia (from *ραχις* the spine, and *αλγος* pain).—*Spinal irritation*, of several modern writers.

59. Classif.—I. Class. IV. Order (*Author*).

60. Definit.—*Pain in some part of the spinal column, generally accompanied by neuralgic or hysterical affections, unattended by fever, or by other indications of inflammation, injury, or structural change of the vertebral column, or of its contents.*

61. Painful affection of the spinal column may be limited to a single point or part, or it may affect more than one part, or extend along a considerable portion of the column. It may be continued, remittent, or intermittent, or even periodic. It may be *nervous* or *hysterical*, *rheumatic*, *gouty*, or *syphilitic*. When the pain is connected with any evidence of inflammation or injury, or structural change, it is merely a symptom of such lesion, and may be inconsiderable, or often not the most prominent symptom. It is generally difficult, and frequently almost impossible to determine, in the present state of our knowledge, the precise seat and nature of the pain which is so severely felt in the spine in nervous and hysterical subjects; but that it is chiefly functional, and intimately connected with pain in other situations, or with some other disorder, are well ascertained facts. How far these may illustrate the nature of true rachialgia will be considered hereafter.

62. i. Description.—The history and description of *spinal irritation* were first furnished by the Franks, under the denomination of *Rachialgia*, and subsequently considered by Nicod, Teale, Brown, Darwall, Tate, Parrish, Griffin, Entz, Ollivier, and Bennett. Most of these writers have viewed the complaint more or less in connexion with neuralgic and hysteric symptoms, and have overlooked some of its other morbid relations. It is generally a consequence of pre-existing disorder, more especially of hysteria, of uterine irritation or disorder, of prolonged leucorrhœa, or of excessive or disordered menstruation, of exhausting discharges, of gout, rheumatism, and several other chronic diseases, attended by debility or nervous exhaustion. It is *characterised* by pain, seated as mentioned above, increased by pressure on the spinous processes in the chief seat of pain, and often accompanied by painful, anomalous or hysterical symptoms in parts supplied with nerves from the seat of pain in the spine.

63. i. *A. Spinal irritation occasioning neuralgia or hysterical affections.*—This is the chief form in which painful affection of the spine presents itself in practice, especially in females, or in weakly constituted or debilitated males. If the reader refer to the article Sympathy he will there find an exposition of the connexion subsisting between the ganglial, sympathetic and spinal nerves, and of the manner in which irritation, undue excitement, or exhaustion, or altered sensibility of any one part of the sensory circle of nervous endowment, may implicate, in some way or other, distant parts,—may induce severe pain, in situations remote from the seat of irritation, or spasm, or various modifications of sensibility, or other anomalous affections. I have shown in various parts of this work, that irritation or other morbid states of parts of the alimentary canal, or of the uterine or sexual organs, or of the kidneys and urinary passages, may be propagated thence to the roots of the spinal nerves, to the chord, and be reflected from these, by either sensory or motive nerves, to internal or distant parts; and that the original seat of irritation may produce these effects, either functionally and without developing inflammatory or other palpable changes, or it may induce these changes, owing to prolonged endurance, to its violence, and to the nature of the exciting causes. (See arts. Chorea, Cholera, Convulsions, Hysteria, Disease, &c.)

64. The remarkable diversity of painful, anomalous and hysterical symptoms attending spinal irritation renders a detailed description of this affection unnecessary. The more prominent features are sufficient for its recognition. The distant symptoms or sympathies are often the only ailments to which the patient has directed attention, or even of which he is cognisant. But the physician, upon hearing of these, immediately infers that the disorder is merely manifested in the extreme ramifications of the nerves; and that it is actually either seated in the origins of these nerves, or that it is transmitted to the gangliated roots of these nerves from visceral or ganglial nerves, or that it has been thus transmitted, in the first instance, but followed, owing to the intensity

or continuance of the irritation, by disease at the origins of the nerves displaying the disorder. He therefore examines attentively the state of the spine, by pressure, percussion, or otherwise, especially at those situations where the nerves supplying the affected parts originate; and he often finds, although the patient has never complained of pain in any part of the spine, great pain in these situations, as well as increased disorder of the distant or external parts, when this examination is being made. Pain, more or less severe in the spine, is also excited by muscular efforts, by a sudden or quick movement or rotation of the spine, or by a jerk or slight concussion, or by taking a false step even in walking.

65. In connexion with the tenderness and pain in one or more parts of the spine, neuralgic pains, spasms or convulsive movements, great tenderness of the surface, sometimes loss or diminution of sensation, occasionally loss of motion or incomplete paralysis, and even, in severe or protracted cases, paraplegia; loss of motion being often more complete in one extremity than in the other, and sensation being but little impaired. When the spinal pain or tenderness is felt in the *dorsal portion*, it is sometimes referred chiefly to one side of the column, generally the left side, and extends to, or is felt only, beneath the left mamma, much more rarely on the right side or in the mamma itself. In these cases it is often associated with hysterical symptoms, with a sense of constriction about the thorax, or with a sense of suffocation, dyspnœa or orthopnœa, pleurodynia, palpitations, or accelerated or irregular action of the heart, spasmodic cough, and various other ailments, which present numerous changes and associations, certain of them ceasing suddenly, others appearing and becoming variously complicated, and often exaggerated by the fears of the patient, or the constant direction of the mind to them.

66. When the lumbar portion of the spine is chiefly affected, then the pains, altered sensibility, spasms, constriction, &c. are complained of in the parietes of the abdomen, or hypogastrium, and pelvis. Numbness, cramps, pains, excessive tenderness, or even more or less complete paralysis in the most severe cases, are experienced in the lower extremities, with constipation, suppression or retention of urine, or irritability of the urinary bladder or uterine organs, disordered menstruation, morbid sensibility of the genito-urinary organs, and occasionally a marked and variable alteration of the state, constitution and quantity of the urine itself.

67. Spinal irritation of the cervical portion is not so frequent as in the situations just mentioned; but it is often connected with a similar affection of one or other of these, especially with the dorsal pain and tenderness. Sometimes the cervical pain rises as high as the occiput, and is then associated with neuralgic pains in the face or neck, with deafness or noise in the ears, difficulty of swallowing, a sense of choaking, loss of voice and even of speech, spasm of the larynx or a state resembling an attack of spasmodic croup, and urgent sense of suffocation, complete aphonia, violent attack of suffocative cough, altered sensibility, or incomplete paralysis of one or both arms, coldness and numbness of one or both hands, pricking sensations, formications, &c., in these extremities, with more or less variability and irritability of temper, and often with several of the other ailments enumerated above.

68. The spinal tenderness in some cases shifts its situation. In these, the sympathetic affections are also changed. In connexion with the symptoms already noticed, the functions of the thoracic and abdominal viscera, and even those of the organs of sense, are more or less disordered, but in various and constantly varying degrees, the seat of disorder depending much upon the portion of spine affected. When the disorder is of a very severe character; when epilepsy, convulsions, amaurotic symptoms, deafness, hesitation or difficulty of speech, retention or suppression of urine, hiccup, vomitings, gastrodynia, obstinate constipation, paralysis, &c. take place, then it becomes a matter of doubt whether or no the spinal affection has proceeded to inflammatory action, or has extended to the base of the brain, or to serious congestion of the spinal veins, with increased serous effusion; and a careful consideration of all the sympathetic and constitutional features of the case is then especially requisite.

69. B. *Rheumatic, gouty, and syphilitic* forms of rachialgia, or painful affection of the spine, especially the rheumatic and gouty, are not infrequent—(*a*). The *rheumatic* occurs chiefly in the rheumatic diathesis; in persons who have suffered previously from rheumatism, and very probably is seated chiefly in the fibrous structures of the spinal column, in the ligaments of the spine, and probably also in the intervertebral structure. It is experienced principally on motion, and in portions of the spine which has been the seat of previous injury, sprain, twist, &c. It is generally diminished by the warmth of bed and by the recumbent posture; and it is often accompanied by several of the sympathetic affections already mentioned; but, when these are severe, and are obviously connected with the seat of pain in the spine—when cramps, numbness, constrictive pain in the muscles, prickings in the extremities, loss of motion, &c.,—then the supervention of inflammatory action, or of effusion, or of thickening of the affected tissues, or of congestion of the vascular apparatus of the spine, should be dreaded, even if not actually existing.

70. (*b*). *Gouty rachialgia* is common in old gouty subjects; affects chiefly the lumbar region; is often attended by weakness or impaired motion of the lower extremities, by incontinence of urine, and by other disorders of the urinary organs, or of the urinary secretion itself, varying with the duration and amount of the spinal affection. Gouty rachialgia is chiefly to be referred to congestion of the venous sinuses of the vertebral canal; this congestion probably inducing an increased fluid effusion, with thickening of the ligaments and fibrous tissues of the vertebræ external to the canal; the functions of the chord, or roots of the nerves, being thereby more or less embarrassed.

71. (*c*). *Syphilitic rachialgia* sometimes occurs in the secondary or tertiary stage of syphilis. It may affect the bodies of the vertebræ, or the intervertebral structures, or the ligaments; but it is very doubtful whether or no it exists as a purely nervous affection in the course of this constitutional malady, before these structures are attacked by the changes characterising the advanced progress of this malady. The portion of the spine most frequently attacked by syphilitic lesion, ac-

cording to my experience, is the cervical, the spinal lesion appearing to me to have been an extension of the alterations which had taken place in the throat and pharynx.

72. (*d*). *Scrofulous rachialgia* may be referred to slow inflammatory change, or to tuberculous deposits, in the bodies of the vertebræ; and hence it, as well as the syphilitic, hardly falls under the present category, but comes more legitimately under the head of *disease of the bodies of the Vertebræ*.

73. ii. The Diagnosis of spinal irritation, or pain in the spine, appearing independently of inflammatory or structural lesion, is by no means so easy as several recent writers appear to believe. Whether the painful affections of the spine are the chief disorder, or are attended by various symptomatic disorders of a more prominent character even than their parent affection, they often so nearly approach the milder grades of inflammatory action, in some one or more of the tissues of the spine, that a precise line of demarcation can hardly be drawn between them. An affection which may be, with much justice, viewed as functional to-day — as spinal irritation merely — may be inflammatory on the morrow, and be rapidly followed by the consequences of inflammation. Or a case may occasion apprehensions of inflammation, and yet, as respects its progress and treatment, prove functional merely; whilst another, furnishing less serious grounds of apprehension, may have been actually inflammatory, and soon furnish undoubted evidence of the usual results of inflammation.

74. The diagnosis between functional and structural rachialgia requires a most attentive consideration of all the circumstances of the case, after a careful examination of the spine, and of the whole extent of constitutional and symptomatic ailment. Messrs. Griffin, who have written with much ability upon this affection, have given the following indications of its existence, especially in its nervous or hysterical form: — "1st. The pain or disorder of any particular organ being altogether out of proportion to the constitutional disturbance. 2nd. The complaints, whatever they may be, usually relieved by the recumbent posture, always increased by lifting weights, bending, stooping, or twisting the spine, and among the poor classes often consequent on the labour of carrying heavy loads, as in drawing water, manure, &c. 3dly. The existence of tenderness at that part of the spine which corresponds with the disordered organ, and the increase of pain in the organ by pressure on the corresponding region of the spine. 4th. The disposition to a sudden transference of the diseased action from one organ or part to another, or the occurrence of hysterical symptoms in affections apparently acute. 5th. The occurrence of fits of yawning or sneezing, which, though not very common symptoms, yet, as scarcely ever occurring in acute or organic diseases, may generally be considered as characteristic of nervous irritation." (*Op. cit.* p. 214.)

75. These may be viewed rather as aids to the diagnosis of this affection than as establishing its existence independently of inflammatory action; for many cases, which have been viewed merely as functional, although presenting some degree of prominence of the spinous processes, in the seat of tenderness, certainly are attended by more or less inflammatory action, or congestion, with swelling of the vertebral tissues, the local changes being insufficient to cause very manifest constitutional disturbance, or to disorder the vital and excreting functions. When, however, these are disordered, the existence of inflammatory action or congestion should be suspected. In all cases presenting swelling or prominence in any marked degree, it will be safer to view this as a result of a mild and slow form of inflammation or congestion, or inflammatory congestion, with slight effusion, than to consider the disorder as merely nervous. (*See the description of disease of the Vertebræ.*)

76. iii. The Duration and Prognosis of spinal irritation require but slight notice. — (*a*). The *duration* of this disorder is most variable. It may be only three or four days, or as many months, or even as many years, according to the severity, the causes and the treatment of individual cases. There is every reason to infer that the more obstinate cases, especially where the treatment has been judicious, is perpetuated either by the continuance of their causes, or by a chronic or recurring inflammatory congestion of one or more of the tissues of the spine.

77. (*b*.) The *prognosis* of this affection is generally favourable, where it is purely nervous or functional. But, when it is attended by phenomena, local and constitutional, indicative of any degree of inflammatory congestion, the several contingencies of such disorder, as respects both the vertebræ and the spinal contents, should be kept in view, and a more cautious or guarded prognosis be given. When rachialgia occurs in connexion with rheumatism, or gout, or scrofula, or syphilis, a much less favourable prognosis ought to be given, than when it is more purely nervous, or simply congestive or inflammatory. In the rheumatic variety there is danger of the affection extending from the ligamentous or fibrous structure to the membranes of the spinal chord; and in the gouty form, especially if it be associated with disorders of the secretion or excretion of urine, a favourable result is often long deferred, or even unattainable in very aged persons; whilst in the scrofulous and syphilitic states of the affection, disease of the bodies of the vertebræ, if not constantly, is generally present, and the prognosis is consequently very unfavourable.

78. iv. The Causes of spinal irritation have been already noticed (§§ 16. *et seq.*) when treating of the causes of spinal diseases generally; but there are certain causes which are more especially productive of painful or functional disorders of the spine. These are certainly much more frequent in females than in males, the female clothing and physical education of the sex favouring, as shown above (§ 18.), this result. Of 248 cases adduced by Mr. Griffin, 26 only were males. It may occur at any age between 10 and 65; and the gouty and rheumatic forms at much more advanced ages. The nervous variety, the most common in females, is met with from 15 years of age to 65, but most frequently from 20 to 25; in its hysterical form from 15 to 50, the menstrual epoch of female existence. It is much more frequent in the unmarried than in the married, and is not confined to any particular habit of body or temperament; the nervous and lymphatic temperaments, however, predominating. The most common exciting causes are, self-pollution, excessive sexual intercourse, uterine disorder, affections of the

stomach and bowels, the presence of worms in the intestines, or other sources of irritation, as morbid secretions, fæcal accumulations, inordinate exertion, sudden muscular efforts, sprains, exposure to cold and moisture, anæmia, rheumatic fevers or chronic affections, &c.

79. v. The Nature of spinal irritation has been much discussed. The pain in the spine, whether it be constant or remittent, or excited only by pressure of the spinous processes in the seat of the affection, can be viewed merely as a symptom of some lesion, functional or structural, either of the tissues constituting the column, or of the cord, membranes, or nerves, and, in this respect, it is, like the more distant symptoms and sympathies attending it, merely an external expression or manifestation of that lesion, whatever it may be. As no opportunity of examining after death a patient who has been the subject of this affection has occurred, as far as I know, until it has passed into undoubted structural change, and become attended by either inflammatory action, or by paraplegia, it is difficult to infer with any precision what is the nature and exact seat of the affection; but there is every reason to infer, with Ludwick, Hoffmann, and the Franks, that it is connected with, if not the result of, congestion of the spinal circulation. The existence of congestion of the venous sinuses of the spine must necessarily affect the capillary circulation of the cord and its membranes, and the amount of the fluid interposed between them; and, as a consequence of the amount or extent of these changes, the functions of this part of the nervous centres, both sensory and motory, and of the nerves proceeding from it, must thereby be more or less disordered. That inflammatory action, or inflammatory congestion, or indeed any form of chronic inflammation, or its usual results, is not the primary lesion in the purely nervous or hysterical rachialgia, may readily be admitted, when we consider the exhausting nature of its causes, and that exhaustion of organic nervous, or vital power always is productive of congestion in parts on which the causes of the exhaustion more immediately act. But it may be as readily allowed, that chronic inflammation is the more prone to supervene in these parts, the greater or more persistent the congestion, especially if the usual causes of inflammation come into operation. I have seen not a few cases of rachialgia, which had been evidently merely congestive or functional at the commencement, but which, by neglect, or improper treatment, had passed into chronic inflammation of the spinal membranes; and I have even seen some of these, owing to super-added causes, or to perturbating influences, pass into an acute state, the inflammation extending along the membranes, until it reached the base of the brain, and terminated in phrenitic delirium, coma, and death.

80. vi. Treatment.—Rachialgia, according to the local and constitutional symptoms and circumstances of the patient, requires very different, and even opposite, means of cure. The spine ought to be carefully examined, and the habit of body of the patient and the causes of the complaint fully considered, before the intentions of cure are entertained. The particulars to which the attention of the physician should be especially directed are.—1st. The presence or absence of local inflammatory signs, of general vascular disturbance, and of plethora or of anæmia; 2nd. The situation of spinal pain and tenderness, and its relation to existing sympathetic affections; 3rd. The presumed or ascertained causes, and the aggravating circumstances; 4th. The existence or non-existence of interrupted, disordered, or suppressed evacuations, especially the catamenial, and the hæmorrhoidal, where this latter has been often a cause of complaint; 5th. The nature and amount of uterine or sexual disorder with which the spinal affection is allied.

81. *A.* If there be actual evidence of inflammatory action or congestion of any of the spinal structures furnished by the local signs and constitutional symptoms, *local vascular depletions*, according to the severity of these symptoms and the state of vascular fullness, as indicated by the pulse and condition of the veins, are obviously required, the amount of depletion being guided by the indications furnished by these sources. The situation from which the blood should be taken has been the topic of some discussion. J. Frank considers, that local depletion attracts the flow of blood to the seat of depletion; and he therefore recommends the application of leeches to the anus. If rachialgia be connected with scanty, interrupted, or suppressed catamenia, or suppressed hæmorrhoids, leeches may be applied to the anus, or below the groins. In these circumstances, there can be no objection to these situations being adopted: indeed, they are the most likely both to restore the suppressed discharge and to relieve the local affection. But in other cases, there can be but little risk incurred from cupping, or applying leeches on each side of the affected portion of the spine, or even a little above or below this part.

82. *B. Blisters*, and *counter-irritants* of different kinds, have likewise been recommended by several recent writers. J. Frank disapproves of their application over or near the affected part of the spine. I have not seen sufficient cause for not having recourse to them, even in these situations, although they are often employed when they are not obviously required, and where recovery would take place without them. A blister, however, is often very beneficial, and its repetition may be necessary. Mr. Tate, who has very justly insisted upon the connection of this affection with disorders of the uterine functions, prefers the inunction of the spine with the tartar emetic ointment. I have found the liniments or embrocations here prescribed much more certainly beneficial than any other local application, or external irritant; and either may be employed some time after a blister has been applied.

No. 337. ℞ Linimenti terebinthinæ ℥ij; tinct. opii ʒj; olei olivæ ʒss; olei cajuputi ʒj. M. Fiat linimentum, vel embrocatio ope spongio-pilei applicanda.

No. 338. ℞ Linimenti camphoræ comp. et linimenti terebinthinæ, āā, ʒiss; vini opii ʒj; olei cajuputi ʒiss. M. Fiat embrocatio, vel linimentum.

83. Even when local depletion is required, restoratives, tonics, or antispasmodics may not be the less necessary; but, in all cases, the adoption and the selection of these ought to have especial reference to the ascertained and inferred causes, to the state of the urine, and to the particular character of the sympathetic affections, — neuralgic, hysterical, or spasmodic. If there appear reason to infer, that the affection has been occasioned by masturbation, even local bleeding will generally be injurious, chalybeates or other tonics and re-

storatives being requisite: but, when the complaint has arisen from this vice, or from excessive sexual intercourse, even the best means cannot be of service unless these causes are relinquished. In females, both the spinal affection, and the uterine or hysterical disorder, with which it is generally associated, equally (although either of them may primarily) arise from this vice, and are perpetuated by persistence in it: and hence the use of the speculum uteri, and of other phalloid instruments, is so gratifying to the patient. In all cases, the urine should be carefully tested, and the treatment regulated conformably with the states presented by it, as fully described in the article on the Urine, and on the disorders connected with this excretion.

84. *C.* When spinal irritation is associated with suppression of the catamenia, then the application of leeches below both groins, two or three days previously to the expected period, and the exhibition of equal quantities of the aloes and myrrh pill, and of the biborate of soda, or of the compound iron mixture and compound decoction of aloes, in doses sufficient to act freely on the bowels, will frequently be efficacious; more especially if the embrocations prescribed above, or No. 311. in the Appendix, be applied to the spine, and repeated according to its effects. In many of these cases, not only are the catamenia irregular, sometimes excessive, but more frequently defective, scanty, suppressed, or difficult and painful; a more or less profuse or continued leucorrhœa often replacing the healthy periodic discharge. In some, these complaints are further complicated with anæmia or chlorosis, and ultimately terminate in irremediable visceral disease. The treatment of these complications, even in their milder forms, is always difficult, and in their severe forms often hopeless, especially when the vice in which they originate is persisted in. The spinal and the sexual disorder frequently act and re-act on each other, until ultimately paraplegia and various associated evils are produced. The uterine affection suggests either vaginal injections or an examination per vaginam; the speculum follows, and various applications are made to the os uteri, of a stimulating, astringent, or irritating nature. As the os uteri possesses an organic sensibility, but little, if at all, inferior to that manifested by the clitoris in the sexual orgasm, neither the vaginal injections, nor the phalloid instrument, nor the applications made by its aid, are at all unpleasant to the self-polluted female. The local irritation thus produced, increases or at the least perpetuates, by nervous communication, the spinal affection; and after the constant attendance of "ladies' doctors" for many months, or even years, the patient having become paraplegic or generally paralysed, and having continued in this state for months, requiring the urine to be drawn off twice or thrice daily, besides other aids, ultimately dies from the extension of disease to the cerebral membranes, or from organic changes in the spinal cord, or in its membranes, or in the kidneys, or in some other organ.

85. As the patient sows, in such cases, so she reaps. But let not the treatment be a perpetuation of the cause of the malady, in a different form—let not the physician furnish, not merely a novel mode, but even a new instrument, of self-pollution; and thus minister to the accursed moral taint of his patient. In many cases, doubtless, this is done unknowingly, by his adopting a method brought into vogue by others and pleasing to the patient, and by his ignorance of this cause of these complaints, — a cause which obtains in at least nine cases out of ten. In most of these the patient will confess to the vice, which has occasioned the disease, if the matter be judiciously managed; and even if this vice should not be admitted, a full exposition of the consequences of persisting in it will produce a good effect; for many patients sin from ignorance, and are not conscious of the evil they are committing. I have had many instances illustrating this position, brought before me. Others (but these are comparatively few) persist in this cause, and either require some restraint or go on, until a drivelling amentia, or irremediable structural disease, overtakes them. When there is reason even for suspecting the existence of this vice, the physician does not discharge his duty to his patient, and to the family of the patient, if he does not investigate the case as circumstances will suggest or admit of; for, if this cause be continued, a cure will be impossible, but by relinquishing it, remedies will be successful, and even the efforts of nature will of themselves be often efficacious. There is one circumstance, which may not be known to many of those who are so much in the habit of recommending stimulating and astringent injections, and irritating or escharotic, substances, to the os uteri, by the aid of large glass or other syringes, or of specula—namely, that similar, and even many of the same, substances were thus employed by the ancients, and by the Chinese and Tartars from remote ages, to excite or to gratify the sexual desires; and that the modern treatment, by these means, of uterine disorders, whether allied or not to spinal irritation, can neither permanently cure these complaints, nor remove "a rooted evil" from the mind.

86. *D.* When the spinal affection is associated with neuralgia, then the preparations of iron, or the sulphate of iron and sulphate of quina, with camphor, hyoscyamus, and as much of the aloes and myrrh pill as will keep the bowels freely open, will be of service, the embrocations prescribed above being applied to the pained portion of the spine; or the treatment advised for Neuralgic Affections may be adopted. If the spinal disorder have been induced by masturbation, or if it be connected with suppressed or scanty catamenia, the combination of substances just now recommended will be of service. If, on the other hand, it be associated with leucorrhœa, or with a superabundance of phosphates in the urine, or with involuntary pollutions, the tincture of the sesquichloride of iron, with a small addition of hydrochloric acid, may be prescribed, with the infusion and tincture of either columba or quassia. In most cases of spinal irritation, the treatment should depend, in great measure, upon the character of the associated or sympathetic affections — whether neuralgic, spasmodic, or hysterical; due attention being also paid to the digestive, assimilating, excreting and uterine functions. But unless the causes be recognised and avoided — unless correct hygeienic measures be also adopted, based upon the predisposing and exciting causes above insisted upon (§§ 16, 78.), the treatment will very frequently be inefficacious.

87. In some prolonged cases of spinal irritation

or congestion, associated with uterine disorder, complete paralysis of the bladder, irritability of the stomach, constipated bowels, and paraplegia, especially as respects the function of motion, sometimes occur. This severe form of the disease generally results from self-pollution, and often resists almost every kind of treatment, if this vice be not discontinued. I have seen several cases of this kind, and the means which I have found most efficacious are, the assiduous application of one or other of the embrocations or liniments already recommended, along the spine; and the use of the iron or myrrh mixture, conjoined with the decoction of aloes, or the pills prescribed above (§§ 53, 84.). Various other means have been also employed, according to the features of particular cases—as the iodide of iron in syrup of sarza, or the iodide of potash in tonic infusions, and occasionally the resinous extract of nux vomica, conjoined with the aloes and myrrh pill. In a severe case of this kind, attended by vomitings, retention of urine, suppression of the catamenia, &c. which I saw with Mr. Flockton, a large pea-issue was made in the inside of both thighs, close to the groins, and a free discharge procured. The paraplegic and other symptoms soon disappeared, and the patient was quite recovered in the course of a very few months.

88. When spinal irritation or congestion has become chronic, it is sometimes accompanied with attacks of faintness, or leipothymia, and, in rare cases, with cataleptic seizures — with the latter, chiefly when the affection has been produced by manustupration. In these, the treatment already advised, or that prescribed in the articles on these affections, will be appropriate. These disorders are chiefly aggravated forms of hysteria, and are to be treated conformably with the principles insisted on, under the heads of Debility, Faintness, Hysteria, Neuralgic Affections, and Spasm: and for these, as well as for spinal irritation and spinal curvature, a digestible and moderate diet, at regular, but not too long intervals between the meals, gentle exercise in the open air, change of air, of scene, and of locality, a residence in a dry and temperate situation, the use of chalybeate mineral springs, or of such mineral waters as the state of the catamenia or of the urine in individual cases will suggest, are important remedies, —indeed, the most requisite elements of the treatment of this group of disorders.

89. *E.* When rachialgia is connected with *rheumatism*, or with *gout*, or with *scrofula* or *syphilis*, the local means already advised may be employed, according to the features of the case; but the treatment should be in great measure based on the constitutional complaint of which the rachialgia is merely a manifestation. In some cases, particularly the rheumatic, gouty, or scrofulous, leeches may be applied, and even repeated, to or near the affected portion of spine, and be followed, by blisters, or by the terebinthinate embrocations and a constitutional or internal treatment suited to the peculiarities of the case, especially by the iodides in the preparations of sarza, the iodide of potassium with the solution or carbonate of potash, and tonic infusions or decoctions; or the bi-chloride of mercury, taken with a full meal, or in a tonic infusion; or Donovan's solution of the iodide of mercury and arsenic, and the preparations of sulphur subsequently, or the sulphuretted mineral waters. In these forms of the complaint, as well as in the nervous or hysterical, avoidance of the causes, a due promotion and regulation of the digestive and depurative functions, and strict attention to diet, regimen, exercise, air, locality, and the purity of the water in use, are essential parts of the treatment.

90. V. Concussion of the Spinal Cord.— The nature and extent of injury sustained by the spinal marrow in circumstances of violence which occasion concussion of this part of the nervous system, can rarely be ascertained soon after its occurrence, and sometimes not even after death.— *A.* The *causes* of concussion are generally falls from a height on the back or trunk, or upon the hips, upon the ground, or even upon any partially yielding surface that may not occasion fracture or dislocation. A violent blow on the back, jumping from a height, a railway concussion or shock, or any sudden or violent succussion of the trunk also may occasion it, in a slight or in a severe form, according to the circumstances of the case.

91. *B.* The *symptoms* vary with the violence and nature of the cause, but consist chiefly of an impairment, in slight cases, and of a more or less complete extinction in severe cases, for a longer or shorter period, of the functions performed by the spinal cord. There are loss of voluntary motion and of sensation, either or both of which may be partial or complete, especially of motion; the excreting functions being generally more or less affected, and the functions of respiration and circulation much disturbed. In most cases, particularly when the concussion has been violent, diminution of temperature, failure of the pulse, pallor, and the other phenomena characteristic of *physical shock* (see art. Shock), are also present.

92. *C.* The *appearances after death* are frequently so slight, or even when most manifest, are altogether such as are insufficient to account for the effects in rapidly fatal cases; and, in those of longer duration, they are generally consecutive upon the change more immediately produced by the concussion. It may be presumed that, in those cases of severe concussion, which are soon followed by dissolution, and yet present no appearance of lesion, the intimate organisation of the cord has sustained an injury incompatible with the discharge of its functions and the continuance of life, although the injury may escape the detection of our senses. In cases of longer duration, softening of the cord, with or without inflammatory appearance, either in the cord or in the pia mater, is often observed; but frequently the softening follows rapidly upon the concussion before inflammatory action supervenes, or even before it has had time to appear.

93. *D.* The *treatment* of concussion of the spinal cord differs not in any respect from what I have recommended when treating of Shock (§§ 19. *et seq.*).

94. VI. Spinal Column. — Inflammation and Caries of the Vertebræ.— Synon:— *Inflammation of the vertebræ, and of the intervertebral substances:—Mal vertebral, Fr.— Pott's disease of the spine:—Spinitis; — Inflammation and caries of the spine.*

Classif.—III. Class.—I. Order (*Author.*)

95. Definit:—*A dull and generally a continued pain in some part of the spine, with slight fever, manifested chiefly towards evening, and often attended by a sense of constriction around the trunk in a*

situation corresponding with the affected portion of the spine, terminating generally in caries, or in symptomatic abscess, or in both.

96. i. Description.—The structures constituting the spinal column are liable to inflammatory action, from sprains, injuries, external violence, from cold, and from constitutional vice or a morbid diathesis. The inflammation thus produced may advance silently and slowly for a considerable time, and suddenly assume a more active or acute form: the affection may even be sub-inflammatory at first, and escape detection, or it may be more acutely inflammatory, and more manifestly declare itself, but it is commonly chronic or slow in its progress. When the disease appears in the scrofulous diathesis, as it does in the majority of instances, it then consists of tuberculous deposits in the cancellated structure of the vertebræ, and can hardly be viewed as inflammatory at the beginning, although it becomes so, in some measure, owing to the irritation caused by the morbid deposit. When it thus proceeds from tubercular deposits, the cancellated bodies of the vertebræ are generally their seat. But it may appear, especially in weak or cachectic constitutions, independently of tubercles, although this occurrence is comparatively rare, and commence either in the intervertebral substance, or in the bodies of the vertebræ, or even in the ligaments covering the spinal column; and ultimately involve the other structures. A recent writer justly remarks, that "the vertebræ in their natural structure are extremely cancellated, and of a vascular texture; and any increase in the circulation of this part may induce inflammation. The ligaments covering the spinal column are also extremely vascular, and the vessels supplying both freely communicate; so that when any increased vascular action is set up in the structure of either, it may continue for some length of time, and very considerably in its activity, relatively to its cause. We observe an example of this in cases where the ligaments are strained by some sudden or powerful exertion. This brings on inflammatory action, in which the cancellated structure of the bones participates, owing to the free communication of the vessels of these two parts." E. W. Tuson, *on Curvatures of the Spine*, &c. p. 218. 8vo. London, 1841.

97. *A.* Inflammation having commenced, it may continue a long time without giving rise to any severe symptom, until at last the motions of the spine, by perpetuating and aggravating the inflammation of the fibrous membrane covering the bones, cause thickening or swelling of it, which, with the products of the inflammation thrown out within the spinal canal, occasions pressure or irritation of the cord, or of the roots of the nerves, and the various spasmodic and paralytic symptoms, which sooner or later supervene. Whether the disease commences in this more unequivocally inflammatory form, or in that of tubercular infiltration of the cancellated structure, on which the inflammation is contingent, the progress it makes is slow, and its nature frequently not clearly declared. There is generally pain in the portion of the spine affected; but this is the case in rachialgia; so that it is difficult, and often impossible, at an early stage to distinguish between this complaint and that, until the inflammation has induced dangerous changes (*see the Diagnosis*).

98. When the disease of the cancellated structure is produced by tubercular infiltration, as it is most frequently, the spinal cord and its membranes are then very rarely implicated until caries has occurred, this lesion often then irritating and affecting the ligaments and membranes, and producing the same symptoms, especially spasms, cramps, paralysis, &c., as generally, at a much earlier period, accompany chronic inflammation of the ligaments covering the bodies of the vertebræ, or of the intervertebral substances. In whichever tissue the inflammation may commence, or whether it originates in this state of morbid action, or in tubercular deposits in the cancellated structure, softening of the bodies of the vertebræ generally results, and the softened structures yield to the weight of the superincumbent parts of the body, and ultimately caries take place. Pott, who was the first to describe accurately this affection, viewed it as generally scrofulous. Paletta, however, contended that this is not the case, and that it often arises independently of the scrofulous taint. In this view Pott has been supported by Boyer, Dugès, and others. Nevertheless, Paletta is in the main correct, for it sometimes proceeds from the following causes, independently of scrofula, although these causes will very readily induce it in the scrofulous diathesis also.

99. *B.* The *Predisposing* occasions of the malady are not infrequently severe attacks of exanthematous fevers, unwholesome or insufficient food, and a humid or impure air in childhood; masturbation about the period of puberty; a syphilitic taint, or general cachexia, and the excessive use of calomel, or of other mercurials in childhood or infancy. The most common *exciting* causes of the inflammatory states of the affection are exposures to cold, external injuries,—as falls, blows, sprains, severe jerks, or sudden twists, or forcible rotations of the spine, and over exertion of the muscles, especially in endeavouring to lift very heavy bodies. A blow over the lower dorsal or upper lumbar vertebræ, particularly when a child or young person is struck in this situation, is very remarkably injurious; for the weight of the upper part of the body carries this part backwards with a sudden jerk or impetus, whilst the parts struck are as forcibly driven forwards. The results are, if the blow be severe, either a luxation or subluxation of two or more of the vertebræ, or a rupture of, or severe injury to, the ligaments and intervertebral substance. The more manifest effects of injuries of this nature may not become manifest until some months have elapsed from their receipt. In such cases, inflammatory action of a slow or chronic kind is occasioned; and this is followed either by thickening, swelling, effusion, or purulent infiltration between the membranous ligaments and the bone, and, as a consequence of the latter changes, by caries of the bodies of one or more vertebræ, or by infiltration of puriform matter between the ligaments and muscles, thereby causing symptomatic abscesses. Disease of the bodies of the vertebræ, proceeding on to caries, consists—1st, of inflammation of the cancellated structure—of an *osteitis vertebralis* of some writers, the *ostéite raréfiante* of M. Gerdy; and 2dly, of tubercular deposits in this structure.

100. *C.* Inflammation commences with increased vascularity of the surface of the affected vertebra,

followed by erosion or incipient ulceration. At a more advanced period, the body of the vertebra is swollen, injected, and of a deeper red colour. At the same time its structure is less dense, softer, and more friable; and is hence more disposed to yield, or to be compressed, or injured by the weight of the superincumbent parts, or by suddenly bending or rotating the trunk, or when lifting heavy bodies. This form of the disease may also commence in the ligaments covering the bodies of the vertebræ; and it may be connected with acute or sub-acute rheumatism, especially when commencing in the ligaments, although this is a rare occurrence: but, however occurring or associated, it may extend to the periosteum, the inflammatory products infiltrating the adjoining parts, detaching the periosteum from the bone, and thereby causing caries of the latter; or it may even originate in the intervertebral fibro-cartilaginous substance, and extend to the other structures, more especially to the bodies of the vertebræ.

101. The disease may commence in the centre or in the sides of the bodies of the vertebræ. In this case, the bone is found to have become redder, softer, and more vascular, and less capable of sustaining a super-incumbent weight or pressure; and the progress of the disease is generally more rapid than when it begins in the intervertebral cartilage, or in the ligaments. If the disease commences in the membrane covering the upper and lower portions of the bodies of the vertebræ, the attachments between these become weakened and ultimately destroyed, and the malady proceeds with considerable rapidity. When it originates in the centre or in one side, or anterior part of the intervertebral substance, ulceration frequently follows, or suppuration supervenes from the extension of the inflammation, the matter infiltrating the adjoining tissues, and either causing or extending the caries of the bone. When the disease commences in the centre of the intervertebral structure, a softened, greyish, and brownish state of the structure is observed; and this is followed by ulceration, disease of the bodies of the vertebræ, caries, suppuration, &c. In these cases, the disease of the structure may advance anteriorly, or to either side, and, according to its direction, occasion not only a more or less angular form of curvature, but a lateral curvature also; a circumstance requiring attention in forming our diagnosis and prognosis. Thus disease of the bodies of the vertebræ may be either primary, or the consequence of inflammation, suppuration, and ulceration of the intervertebral substance, and of the ligamentous apparatus of the column.

102. *D*. Tubercular disease of the bodies of the vertebræ occurs either as an infiltration of the cancellated structure with tubercular matter, or as an agglomeration of the matter into masses, which are surrounded by a cyst or envelope; this latter being more frequent and most manifest. In these cases the tubercular masses undergo similar changes to those observed in the lungs; and as they pass from a crude to a softened state, excavation and ulceration of the containing or surrounding parts takes place, until the vertebra is nearly reduced to a shell, or is formed into several cells, and becomes crushed under the superincumbent weight; the spinous processes of the diseased vertebræ, which at first were merely tender and prominent, rapidly becoming angular, and passing from an obtuse to a more acute form. As soon as the curvature presents a sharp or angular projection, destruction or loss of substance of a part of one or more of the bodies of the vertebræ may be inferred. The resulting deformity will depend upon the portion of the spine affected, and the extent of destruction which has taken place.

103. ii. The Symptoms and Diagnosis of this state of spinal disease are extremely delusive at an early stage, and before curvature becomes manifest; and it is still more difficult to determine, even at any stage of the complaint, in many cases, whether the malady results from inflammatory action, or from tubercular deposition, or from both, either having been the primary change. A knowledge of the constitution or diathesis of the patient, of the causes which have produced the disease, and of the whole history of the case, will often throw considerable, or even sufficient, light on its nature; but these data may be wanting, and the only information which can be obtained may be afforded only by the existing state of the patient, or even by the angular distortion demonstrating more or less destruction of the bodies of the vertebræ. Whilst the scrofulous diathesis, and the stealthy progress of the affection, indicate tubercular deposits as the cause in the one case, the previous occurrence of injury, and the absence of the scrofulous taint, will suggest inflammatory action in the other; and, when viewed in connection with more or less pain, and with the other symptoms, will often evince the nature of the mischief, even before it has advanced to angular projection. Pain is not, however, a constant symptom even in the more inflammatory state of the disease, especially at an early stage, and often it never amounts to more than an aching; whilst in the scrofulous form, pain may not be much complained of, unless on some occasions. As the disease advances, pain is either more constant, or more severe, especially in certain postures, or when rotating or bending the spine; and it is attended by a sense of constriction and pain in the base of the thorax and epigastrium, or in the abdomen, according to the part of the spine affected. Even before any marked curvature is detected, this constrictive pain is often felt, and the patient sometimes complains of a grating sensation when turning or rotating the spine, more especially when the disease originates in inflammation of the vertebræ, or of the spinal ligaments. In addition to these symptoms, nausea, vomiting, attacks of pain at the epigastrium, dyspnœa, restlessness, costiveness, and evening exacerbations of fever supervene, with increased sensibility of the surface, and cramps, or sometimes numbness of the lower extremities. These may continue an indefinite, but generally a considerable period; the angular character of the curvature becoming more and more manifest. The patient now is generally unable to sustain the weight of the parts above the diseased portion of the spinal column; and he endeavours, when erect, to support himself by leaning upon his elbows or arms, or by placing his hands upon his hips or thighs. He becomes also less capable of walking, his gait being unsteady, shuffling, or peculiar and slow.

104. Whether originating in inflammation, or in tubercular deposits in the bodies of the vertebræ, the angular projection of the spinous processes is not very great until caries of the bone, and ulcer-

ative destruction of the intervertebral substance, have advanced. The loss of structure in a portion of the column, owing to the weight of the superincumbent parts, is attended by more or less distortion, not only of the posterior aspect of the spine, but also of the anterior regions of the trunk. According as the cervical, the dorsal, or the lumbar vertebræ are diseased, the distortion varies remarkably, and as a necessary consequence of the difference in the conformation and attachments of the vertebræ of these regions.

105. *a.* When the *cervical vertebræ* become carious — an occurrence, according to my experience, observed chiefly as a sequela of scarlet fever—the curvature or projection of the spine is not marked; but the neck becomes shortened, drawn somewhat to one side, and is moved with great pain. Partial or incomplete paralysis, chiefly of motion, is often experienced, and frequently increases or passes into general palsy, terminating in asphyxia. Yet I have seen cases in which anchylosis took place, the recovery being complete and permanent, the neck being only shortened, and rendered stiff, the head being generally turned somewhat to one side.

106. *b.* When the *lower cervical* and *upper dorsal vertebræ* sink from loss of structure, the chest is flattened, the sternum is drawn inwards and downwards, and the patient generally experiences difficulty of breathing, owing to the impaired action of the scaleni and other respiratory muscles. The depression of the chest anteriorly is often very great in these cases. When the middle or lower dorsal vertebræ are diseased, the chest is either flattened anteriorly, or in a lateral direction, one side falling inwards more than another; or either side may be compressed whilst the other projects; or both sides may be flattened, and the sternum pushed forwards. The thorax always approaches very close to the pelvis, and the abdomen is much shortened. The distortion varies much with the seat and extent of caries; and, according as either side of the vertebræ is more affected than the other; the posture most commonly assumed by the patient, and found most easy, also influencing the form of distortion.

107. *c.* When the *lumbar vertebræ* are diseased, the lower or floating ribs are sunk inwards and downwards, and sometimes even below the crests of the ilium. The abdominal regions fall inwards, and are much diminished in their vertical direction. Owing to a greater or less amount of caries in one side of the vertebræ than in the other, or to continuing a certain posture in preference to any other, or to spasm, or permanent contraction of certain muscles, more or less of lateral curvature may be associated with angular projection of the spine, the caries being the cause of both the forms of curvature. When these cases terminate favourably, or when anchylosis takes place, this associated form of curvature may exist to a greater or less extent, and even be attended by some degree of twist, or contraction of the trunk to either side.

108. iii. THE CONSEQUENCES, COMPLICATIONS, AND TERMINATIONS of angular projection or curvature of the spine are—1st, changes in the tissues external to the spinal column, or in its vicinity; 2nd, changes in the structures lodged in the spinal canal, and in the nerves issuing from the canal; and, 3rd, alterations of a restorative nature in the seat of the disease.

109. (*a.*) When inflammation, ulceration, or caries exists in one or more of the vertebræ, the usual products of these changes frequently contaminate the adjoining cellular tissue, induce inflammatory action, and give rise to purulent formations, which pass in various directions, according to the peculiarities of the case, ultimately pointing externally, or even internally, at a distance from the original seat of disease, as fully shown when treating of *symptomatic abscess.* (See art. ABSCESS, §§ 24. *et seq.*)

110. (*b.*) Although inflammation or caries of one or more of the vertebræ often exists without implicating the spinal cord, or its membranes, or even the nerves proceeding from the canal, nevertheless the membranes are often affected, a chronic form of inflammation being developed, which may be followed by effusion of lymph, and by consecutive changes in the cord, or in the roots of the spinal nerves. When the membranes or cord are thus implicated, the symptoms about to be described, as indicative of inflammation of these parts (§§ 120. *et seq.*), are observed, and are usually followed by incomplete or complete paraplegia, and often by the extension of the morbid action along the spinal membranes to the base of the brain, occasioning general paralysis, delirium, coma, and death. But, independently of any affection of the cord, or of its membranes, the nerves may be subjected to pressure, owing to the attendant swelling of the parts surrounding their exits from the spine, or to the destruction of parts in the progress of caries. If the pressure be slight, or if it occasion merely irritation of the nerves, severe or neuralgic pains in the course or terminations of the affected nerves, or cramps of the muscles supplied with them, will be experienced; but if the pressure be greater, paralysis of motion, or of sensation, or of both, will be present. Thus, owing to consecutive affection—to the consequent congestion, irritation, or inflammatory action, tumefaction, effusion, and pressure, implicating the membranes of the spinal cord, the origins of the spinal nerves, and even the cord itself, pain, spasm, paralysis, &c. supervene and complicate the disease of the vertebræ; and, with or without either of these states of associated disorder, suppuration not infrequently takes place in the adjoining cellular parts, and purulent collections form, and often extend to considerable distances from the seat of caries (§ 109.). In most cases, pain of a severe form is experienced in the seat of lesion, and even still more severely in the lower extremities, whilst the urinary functions are often more or less disordered.

111. (*c.*) When the destruction of one or more of the vertebræ has proceeded to an indefinite extent, a reparative process—*anchylosis*—often commences, owing to a salutary change in the constitution of the patient, produced either by an improvement in the diet, or in the air, or by a judicious treatment; and a matter is exuded, which becomes the seat of an osseous formation, cementing the adjoining vertebræ, and often partially filling up the spaces left by the destruction of the bodies of one or more of the diseased vertebræ. In these cases, the intervertebral and cartilaginous portions of the spine which have been destroyed are not restored, the osseous formations extending, without loss of continuity, but with varying grades of thickness, from the adjoining healthy vertebræ.

112. iv. The Duration and Prognosis of caries of the vertebræ may be inferred from what has been already advanced. The *duration* of the malady is rarely less than two or three months, and it may be as many years. The *prognosis* depends much upon the habit of body, and previous health of the patient. Also upon the presence of suppuration, or of paralysis, or of both. Matter often forms and collects near the column, especially its anterior surface; and, in the more favourable of these cases, opens externally, the track of the matter being sometimes very long, and the external opening distant from the diseased vertebræ. The carious destruction may, even in some of these cases, be repaired by anchylosis, and by the column falling together at the angle corresponding to the quantity of substance lost; but much more frequently the disease exhausts the patient, the symptoms usually showing that the spinal cord and its membranes suffer more or less. Thus the cord itself may be compressed by tumefaction of the ligamentous apparatus, by the irruption of an abscess into the canal, by dislocation of fragments, or of the whole, of a vertebra, or by the products of circumscribed inflammation of the dura mater of the cord; or it may be bent, pressed upon, or irritated, at the spot where the angular projection is commencing; or it may waste, or circumscribed inflammation may take place in it, or diffused inflammation in its membranes. When the upper dorsal vertebræ are carious, the abscess sometimes opens into the thoracic cavity, or into one of the bronchi, and matter and necrosed or carious fragments of vertebræ are discharged through the air-passages. Caries of the abdominal part of the column is very often complicated with what is commonly called *psoas abscess.*

113. The prognosis may be further directed by the following symptoms:—If a scrofulous or syphilitic taint exist; if the constitutional or vital powers be much depressed; if symptoms of inflammation of the membrane appear; if palsy, or even cramps, supervene; and, more especially, if the palsy extends; if febrile symptoms with delirium are present; and if the urinary functions are much disordered, an unfavourable opinion of the issue should be entertained. On the other hand, if the general health be not greatly impaired; if the several excreting functions are not materially affected; if sensation and motion are not disordered; if pain or constriction is not present, and if the digestive and assimilative functions are not much disturbed, more or less complete restoration to a healthy state, by means of anchylosis, may be expected.

114. v. Treatment. — The means of cure should depend chiefly upon the causes and circumstances originating the disease. If inflammatory symptoms be present at an early stage,—if these have followed a blow, sudden jerk, or injury of any kind; and if constriction, severe pain, increased by motion, be complained of, the application of leeches, or of cupping glasses, near the seat of pain, will generally be serviceable. These may be followed by a terebinthinate embrocation, or by a blister, the latter being applied considerably below the seat of the disease; or the blister may follow several applications of the embrocation; or it may be kept discharging for some time. These means, however, ought to be employed, or persisted in with due caution, and a careful observation of their effects.

115. If the disease appear independently of any injury, violent exertion, or inflammatory cause; if it come on in a gradual or stealthy manner; if it occur in a scrofulous, cachectic, or syphilitic diathesis, or taint; if the patient feels a grating sensation when rotating the trunk; and if indications of purulent formations in the vicinity, or of a symptomatic abscess, are present, neither leeches, nor cupping, nor blisters, will be of any service; they will much more frequently be prejudicial. In these forms and states of the disease, such means as will remove the weight of the upper parts of the frame from the diseased vertebræ, and promote vital resistance to the extension of the disease, and improve the digestive, assimilative, and excreting functions, have been found most beneficial in my practice—even in some cases of great and almost hopeless severity. A combination of these, with such as more frequently produce an alterative influence upon the capillary circulation, more especially with the preparations of iodine, or with the bichloride of mercury, or with the solution of potash, or Brandish's alkaline solution, ought always to be preferred. I have often found that a change from a course of some continuance of the one, to that of another form of combination, has been of manifest benefit—that the exhibition of the bichloride, in the simple or compound tincture of cinchona and fluid extract, or concentrated compound decoction of sarza, for a longer or shorter period, according to circumstances, followed by the compound tincture of iodine, or the iodide of potassium, with Brandish's solution, or the carbonate of potash, and the other preparations just mentioned, has been of very essential benefit.

116. When the inflammatory form of the disease has gone on to the production of caries, or to suppuration, and in the scrofulous, syphilitic, or rheumatic states, the above means are most deserving adoption, and may often be aided by the application of the liniment already prescribed (§§ 54.) along the spine, or of some one of the other terebinthinate liniments prescribed in various parts of this work, as well as in the *Appendix*. When the disease is attended by anæmia and much debility, then the preparations of iron, especially the iodide of iron, should be given in syrup or sarza, or in other suitable forms. In the several scrofulous states of the disease, the means advised for the treatment of Scrofula (§§ 172. *et seq.*) will be of more or less service. The propriety of having recourse to issues, or setons, or moxas, or other forms of derivation, has been a subject of discussion. Pott recommended issues on each side of the projecting spinous processes, and the practice has been very generally adopted since his time, with apparent benefit in some cases, and with no advantage in others. Sir B. Brodie, an authority of the greatest weight, states that he has seen no benefit result from the use either of these or of blisters. There can be no doubt that they are not so generally, or even so often, beneficial, as they were formerly believed to be, and that an indiscriminating recourse to them is as frequently injurious as beneficial; but, if due regard be paid to the form, state, or progress of the disease, they will often be of service; if, however, caries be extensive; if it be attended

by anæmia, great emaciation and debility; if the digestive, assimilating, and excreting functions be much impaired; and if the medicinal and regimenal treatment be not prescribed appropriately to the state and peculiarities of each case, these and similar means will not only entirely fail, but will even accelerate a fatal issue, by lowering still further the already depressed condition of vital power, and by increasing the extent of caries, or the amount of suppuration, or of vascular contamination. I have usually had recourse to these means only after inflammatory symptoms have been combatted as far as circumstances permitted, and when the contra-indications to their use were not present; and during their employment I have advised the tonic and alterative treatment already mentioned (§§ 115, 116.), with due attention to diet, change of air, &c.

117. Whilst duly regulated modes of *exercise* are beneficial in other kinds of curvature, perfect *rest* is requisite in this; but rest should be aided by a wholesome air, and a well-ventilated apartment. The use of those couches which facilitate the *prone* posture should be adopted; and, whilst all measures which forcibly extend the spine and risk injury to the structures contained by or adjoining the diseased vertebræ, ought to be avoided, the position chiefly maintained should as much as possible be such as will prevent the increase of curvature. This is as much as may be expected from couches merely; but, either with or without these, the avoidance of all motions of the vertebræ—either of flexure or rotation—ought to be studied. Forcible extension of the flexed portion, or forcible depression of the projection, may injure the early reparative changes of the diseased parts, by which anchylosis, and a restoration to a comparatively healthy state are affected.*

118. The consecutive disorders (§§108-111.), especially symptomatic abscess and paralysis, which often complicate angular curvature or caries of the spine, caused either by inflammation or scrofulous disease of the vertebræ, should be treated conformably with the views above exhibited, but appropriately to the stages and states of each case, and to the particular disorders which have been thus superinduced. As to the additional means which these latter require, I must refer the reader to what has been fully stated respecting them when treating of *symptomatic abscess.* (See Abscess, §§ 62. *et seq.*), of *Paralysis* (§§ 204. *et seq.*), and of *Spasm* (§ 313.), where such measures as are most suitable to each of these associations are described.

119. VII. Inflammation of the Membranes, and of the Spinal Cord.—Synon.—*Rachialgitis*, J. Frank:—*Rachialgia Inflammatoria*—*inflammation commencing in, or extending to, either the spinal cord or its membranes, or both.*

Classif.—III. Class.—I. Order (*Author*).

120. Definit.—i. *Pain in the spine, often acute, with or without rigors, commencing with increased sensibility of the surface of the body, and symptomatic fever, followed by spasms, cramps, constriction, &c., especially on motion, passing into palsy, usually in the form of partial or complete paraplegia, or general paralysis, with interrupted or disordered excretion.*

121. ii. Pathol. Definit.—*Inflammation occurring primarily in, or extended to, either the dura mater, or arachnoid, or pia mater of the cord, or the spinal cord itself, and generally implicating two or more of these, followed by thickening, effusions, adhesions, disorganization, &c.*

122. The diseases of the spinal cord, whether inflammatory or structural, present numerous analogies to those of the brain, not merely in their natures, which are frequently identical, but also in the phenomena to which they give origin. My friend Dr. Wood, of Philadelphia, justly remarks in his very excellent work, that there is in both brain and spinal marrow the same liability to inflammation of the membranes and the nervous matter, to derangement from non-inflammatory organic affections, including hæmorrhagic and serous effusion; and these different affections in the one not infrequently merely extensions of the same affections in the other. Like the brain, too, the spinal marrow contains nervous centres and conducting filaments, and it may suffer disease in these constituents separately or conjointly.

123. The spinal cord discharges certain offices, a knowledge of which is necessary to the diagnosis of its diseases.—1st. It receives impressions from other parts of the body, and transmits influence to these parts, either independently of the brain, or with the due exercise of the functions of the brain; — 2nd. It conveys influence to and from the brain; — 3rd. It is the medium by which impressions or influences are often conveyed from the ganglial centres to external and voluntary parts, and from the latter to the former.—(*a.*) According to its *first* office, it aids the ganglia in the discharge of their functions, and reinforces their energies; whilst, on the other hand, the ganglial influence is extended to it, by means of communicating or anastomosing branches. Hence lesions of the cord or of its membranes very manifestly affect respiration, assimilation, secretion, excretion, and reproduction.—(*b.*) Conformably with its *second* office, voluntary motion or sensation, or both, are interrupted, or disordered, or perverted, when either the spinal marrow or its membranes are diseased.—(*c.*) And, according to its *third* office, irritation or other affections of internal viscera, digestive, excreting, and reproductive, are frequently transmitted to external, distant, and voluntary parts, and from these latter to the former, as illustrated by the origins and courses of many diseases.

124. It is manifest that the amount, as well as the character and seat of disorder, will vary remarkably with the particular structure inflamed, or otherwise diseased, and with the situation of the diseased part in the spinal canal, or with the extent of it along the cord. In estimating, therefore, the seat and nature of the malady indicated by the symptoms, certain pathological conditions should be kept in recollection:—1st. Disease or injury of the vertebræ, or of the intervertebral substance, or of the ligamentous apparatus, may, by irritation or pressure, more or less interrupt, disorder, or pervert the functions discharged by the spinal cord. 2nd. The products of congestion, or of inflammation of the membranes, may, by irritation or pressure, exert a similar influence, in respect of the offices of the cord, independently of any actual or manifest disease or change

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* I have great pleasure in referring the reader to what Mr. Bishop has stated on this subject, in his very able and philosophical work on Deformities of the Human Body, which appeared as this sheet was passing the press.

in it. 3rd. That inflammation, aided by its usual products may, on the one hand, extend not only to two, or to all the membranes, but also to the substance of the cord itself. 4th. That inflammatory or other lesions of the cord itself, may, on the other hand, extend to one or all its membranes. 5th. That this extension of the disease to the several structures is more frequent than the limitation of it to one only; and the extension of morbid action, more or less along the spinal membranes and cord — or even to the base of the brain—is much more common, especially in very young subjects, than the limitation of it to a part only. 6th. That the extension and diffusion of inflammation is more rapid and general in the membranes than in the substance of the cord; and more so in delicate, scrofulous, and cachectic habits, than in the robust and healthy. 7th. That, as far as my own experience enables me to judge, the extension of meningitis spinalis upwards to the brain is much more frequent than the extension of it downwards along the spine; and the latter mode of extension, as well as the complication of spinal meningitis with cerebral meningitis, is most frequent in very young and delicate children, and in cachectic and broken down constitutions.

125. Although inflammation of the membranes is often associated with inflammation of the substance of the spinal cord, the disease commencing or predominating in either, still the one or the other may be separately, solely, or chiefly inflamed; and hence it is in some measure requisite to consider the phenomena which more especially belong to each, and which indicate a more prominent affection of one structure than of the other, when they are all more or less implicated. I shall therefore first notice inflammations of the membranes, and next inflammation of the substance of the cord.

126. i. INFLAMMATION OF THE MEMBRANES OF THE SPINAL CORD. — SYNON. — *Meningitis spinalis* — *Arachnitis spinalis* — *Meningite spinale*, *Fr.*—*Spinal Meningitis.*

127. DEFINIT.—*Acute pain in the course of the spine, with or without rigors, attended by increased sensibility of the surface of the body, by symptomatic fever, by tonic spasms, especially on motion, followed by palsy, and often by delirium and coma.*

128. Although either of the membranes of the spinal cord may be primarily, or even separately and solely inflamed, yet the symptoms which more especially belong to the affection of each—which indicate either their separate or conjoint disease—cannot be distinguished in such a manner as to justify an attempt to form a diagnosis between them. That these membranes may be separately inflamed, although their conjoint affection is much more common, is often rendered manifest by the appearances observed after death, the pia mater displaying most frequently and most evidently the changes characteristic of inflammatory action.

129. *a.* The *dura mater* of the spinal cord is very seldom inflamed, unless as a consequence of injuries of the spine and disease of the vertebræ. In rare instances, however, I have found it inflamed in connection with acute rheumatism, the usual changes consequent upon inflammation of the membrane, and of fibrous tissues in general, namely, exudation on the inner free surface, thickening, and adhesion to the arachnoid, having been found after death.

130. After injuries and caries of the vertebræ, local or circumscribed inflammation of the dura mater has occurred. In these circumstances, effusion of fluid has been seen exteriorly to the membrane, or between it and the bodies of the vertebræ, with or without exudations from the arachnoid lining the dura mater, &c. These changes have been described by BERGAMASCHI, LALLEMAND, OLLIVIER, myself, and many others.

131. *b.* The *spinal arachnoid*, especially in its visceral layer, forms a sac, which does not adhere closely to the pia mater, as it does within the cranium. This visceral layer, and the sac within it, are the seats of the most serious lesions of the inner membranes of the cord — of both the *arachnoid*, and of the *pia mater* of the cord. Inflammation of the arachnoid—*arachnitis spinalis*—is rarely observed without inflammation of the *pia mater* of the cord, and the vascularity is much more manifest in the latter membrane than in the former. There is, however, one change often seen in the arachnoid alone that may be viewed as a consequence of repeated or protracted congestions, or of slight attacks of inflammation. This consists of dulness, opacity, and thickening of the arachnoid, and is usually combined with chronic effusion of serum into its sac, especially the inner sac. Adhesions between the arachnoid and dura mater are rarely seen, unless as a consequence of injuries.

132. *c.* Inflammation of the *pia mater* of the cord (*meningitis spinalis*) may occur spontaneously or primarily, but it is most commonly connected with inflammation of the other membranes — frequently a consequence of inflammation of one or both; and is generally occasioned by external injuries. Spontaneous inflammation of the pia mater of the cord is often associated with cerebral meningitis, and is then especially extended along the spinal cord. This complication is most frequent in infancy and early childhood. Inflammation of the pia mater is also commonly associated with inflammation of the substance of the cord with *myelitis*. I shall first notice acute spinal meningitis, subsequently the chronic states of the disease, and lastly, the complications which spinal meningitis often presents in practice.

133. *A.* ACUTE SPINAL MENINGITIS.—*a.* Acute inflammation of the membranes of the cord, when occurring as a *primary and uncomplicated malady*, generally commences with pain or soreness in the spine, with chills or rigors, and increased sensibility of the surface of the body. In other cases, the attack is more sudden and violent, with a sense of heaviness, pain, or uneasiness in the extremities. The pain is severe, and, although beginning in a particular part or region, generally extends more or less along the spine. The cervical region is most frequently attacked, especially in children, but the situation first affected depends much upon the cause in relation to the portion of the spine on which it acts. The pain is not confined to the spine, for all parts of the frame supplied with nerves proceeding from the portion affected, or its vicinity, are more or less subject to neuralgic pains, or uneasiness, tingling, and formication, accompanied with spasms, and with constrictions around the corresponding parts of the

trunk. These symptoms are always increased on motion, and in infants on their being moved, and when lying on the back on a warm bed.

134. When the cervical portion of the membranes is most affected, trismus, spasmodic retraction of the head, and tonic spasm of the spinal muscles, contraction or spasm of one or both arms, and twitchings or convulsive movements of the lower limbs, are commonly present. When the dorsal or lumbar portions are chiefly affected, painful constriction of the thorax or abdomen, increased pain on motion, with the other symptoms already mentioned, are present. In extreme cases the spasmodic contractions of the dorsal muscles recur, or are exacerbated, at intervals, and give rise to attacks of opisthotonos. Although the lower extremities are affected by pain, cramps, or clonic spasms, and are more or less enfeebled, the power of voluntary motion is not lost at an early stage; but it becomes much impaired, and ultimately abolished at an advanced period, and when the disease is not arrested in its usual course.

135. Febrile symptoms are always present; the pulse is hard, frequent, and constricted, or sometimes small; the heart's impulse is increased; the skin hot, acutely sensitive, sometimes perspiring freely; respiration is laborious, anxious, suppressed, or painful; the bowels are constipated; and the urine is suppressed or retained.

136. The above symptoms remit and recur at intervals, but they rarely intermit; and if the course of the disease be not arrested, they return with greater violence, the local symptoms evincing the extension of the disease along the spine, if it have commenced in any part of the column, until the paralytic affections become more and more general or complete, and until drowsiness, lethargy or delirium; irregularity, smallness or slowness of the pulse; involuntary evacuations, retention or incontinence, or alteration of the urine, and ultimately either asphyxia or coma, or both, supervene, and indicate the extension of the disease to the base of the brain, as well as the more or less complete abolition of the functions of the cord, by the products of inflammation of its membranes. A fatal issue may take place in four or five days, or from that time to two or three weeks, from the commencement of the attack.

137. *b. On examination after death*, the dura mater is generally found of a deeper colour than natural. The arachnoid is duller, more opaque, and somewhat thickened. The pia mater is reddened, injected, and swollen, especially in its posterior aspect. Fluid is effused between the membranes, especially between the pia mater and arachnoid, which is sometimes turbid, but more frequently coagulated, or in the state of coagulated lymph; or a purulent matter, occasionally mixed with a turbid serum or lymph, is sometimes met with. These changes may be limited to a portion of the cord, but they are more frequently extended more or less along it. The substance of the cord is often more vascular than natural. It is sometimes less vascular and firmer than usual, probably owing to the pressure occasioned by the effused fluids. It is not softened, unless the inflammation has extended into it.

138. *c. The association of spinal meningitis with cerebral meningitis—acute cerebro-spinal meningitis*—is more common than uncomplicated spinal meningitis, especially in infants and children. The disease may commence in either the spine, or within the cranium, and extend more or less rapidly from the one to the other. It rarely occurs co-etaneously in both. According to my experience, it most frequently commences in or near the base of the brain in children, extending downwards; and oftener in the spine in adults, advancing upwards to the brain. It has been observed, in both endemic and epidemic forms, in some parts of Ireland and France; and Dr. WOOD refers to Drs. HICKS, TAYLOR, and AMES, who have described its occurrence, in these forms, in some districts of the south-western states of North America.

139. *Cerebro-spinal meningitis* commences, in the milder cases, with general uneasiness, a sense of fatigue, headache, pain in the neck and back, extending often along the spine, stiffness of the jaws, difficulty of deglutition, constipation, and retention of urine, or difficulty of micturition. As the disease advances, headache becomes more violent, and is attended by great sensitiveness of light and sound, by rigid spasms, retraction of the head and neck, acute sensibility of the surface of the body, by increased rigidity of the trunk, or cramps of the extremities on motion, and by convulsive movements of the limbs. The febrile excitement is great; the pulse is very frequent, constricted, or small; the skin is hot, thirst is urgent and constant, delirium supervenes, and is often preceded by vomitings.

140. In the severest attacks, chills or rigors, attended by severe pain in the abdomen and spine, and by vomitings and purging, are followed by reaction, and by all or most of the symptoms now enumerated in a more violent form. If the disease be not early arrested by treatment, more or less general paralysis and coma soon follow the above symptoms, and death ensues. The disease may run its course in forty-eight hours; but it much more frequently continues for six or seven days, and sometimes it may be prolonged to two or three weeks.

141. *d. On dissection*, the morbid appearances are said to have been comparatively slight, in some of the endemic or epidemic cases, vascularity and effusion not having been great, although more or less general, and the substance of the brain and cord not sensibly altered. More frequently, however, the changes have been remarkable, especially an effusion of greenish or yellowish lymph between the arachnoid and pia mater, which was scanty or nearly absent on the cerebral hemispheres, but much more abundant at the base of the brain, and in the spinal column, either investing the cord completely, or somewhat more abundant on its posterior aspect. It has sometimes extended along the whole cord to the extremity of the caudex equina, coating even the roots or commencement of the spinal nerves. This morbid exudation has not been found in the external sac of either the cranial or the spinal arachnoid.

142. *B.* CHRONIC SPINAL MENINGITIS.—Chronic inflammation of the membranes of the spinal cord has hitherto been very imperfectly described and illustrated, and, as far as my own experience warrants the statement, it is certainly not so rare a malady as stated by several recent writers. It may occur as a consequence of an acute or sub-

acute state of spinal meningitis; but I have observed it much more frequently as the primary disease, upon which an acute or sub-acute state supervened sooner or later, or as the disease extended upwards to the medulla oblongata, or base of the brain. The earliest account of a case of chronic spinal meningitis, with the appearance after death, was recorded by myself in 1820; and since then I have seen a considerable number, and examined the bodies of several of them.

143. Whilst the morbid appearances in the cases of acute spinal meningitis have been such, as far as I have observed them, as to indicate the chief seat of morbid action to have been the inner sac of the arachnoid, or between the arachnoid and pia mater, the changes in chronic spinal meningitis have shown the external cavity or sac to have been their principal or only seat, effusion of coagulable lymph between the arachnoid of the dura mater and the visceral arachnoid, obliterating the cavity by adhesions of the opposite surfaces by this medium. This diversity may depend upon the circumstance of the disease assuming not only a more acute, but a more rapidly diffusive character when the inner arachnoid is attacked, or when the fluid is effused between the arachnoid and pia mater, than when the disease commences, as it probably does in chronic cases, either in the dura mater, or on the arachnoid covering it. Chronic meningitis may follow the acute form, or be produced by any of the causes about to be assigned.

144. *a.* The *causes* of chronic spinal meningitis are the causes of spinal maladies generally (§§ 16. *et seq.*), but they are more especially blows or falls on the spine, particularly on its lower regions; currents of cold air, after having been over-heated, directed on the spine; sprains or bruises of the column; sleeping in damp beds, or upon the ground; the abuse of alcoholic liquors; venereal excesses; the extension or metastasis of rheumatism to the membranes and ligaments of the spine; the congestion of the spinal membranes during continued and eruptive fevers; caries of the vertebræ; and various organic changes implicating the cord or the membranes.

145. *b.* The *symptoms*, especially the initiatory symptoms, vary much, according to the cause, to the temperament, habit of body, and age of the patient, and to the region of the spine primarily affected. Whatever part may be first attacked, the tendency to spread, or to extend upwards, as well as downwards, should not be overlooked; for, although this tendency is not nearly so remarkable as in acute spinal meningitis, yet it exists more or less. It may not be remarked for months, or even for years, in the more robust and otherwise healthy subjects, the patient hardly presenting any increase of ailment, or even becoming greatly relieved; but more frequently, especially in delicate or cachectic persons, or during an injudicious treatment, the symptoms extend and become aggravated, more or less rapidly, and either pass into a sub-acute or an acute state, or indicate the extension of the inflammatory action to the base of the brain. This aggravation and extension of the malady are favoured by a recurrence of the causes which first induced it, by mental perturbation, by physical exertions, attended by sudden or frequent movements of the spine, by measures which lower the powers of life and of vital resistance, by imperfect attention to the digestive, secreting, and excreting functions, &c.

146. Chronic spinal meningitis generally comes on slowly and insidiously; and, owing to many of the most severe symptoms being experienced in parts far removed from the spine, it is often, at early periods of its course, mistaken for chronic rheumatism, for neuralgia, or for simple weakness of the limbs, or even for atonic gout. As it proceeds, it may be viewed as a form of rachialgia or spinal irritation, or as an attack of chorea, either of which may be followed by, or pass into, chronic spinal meningitis, at some period of their course, even if they should not prove identical with the early progress or commencement of chronic inflammatory action in the spinal membranes, or with congestive states of these membranes, upon which the inflammatory may supervene.

147. The patient complains of aching, or of dull pains in some part of the spine, generally connected with pains in the nerves, or in their extremities, corresponding with the part of the spine affected; or with pains in the extremities; or with formication, tinglings, prickings; or with a combination of these, with some degree of numbness in the lower limbs. The pain in the lower extremities is sometimes most poignant, especially in certain positions or movements; is occasionally absent, or intermittent, or remittent; and is succeeded during the intermissions by uneasiness in various forms. The gait of the patient becomes now weak, unsteady, and tottering. He moves with difficulty or uncertainty, and staggers or straddles when he attempts to walk. If the disease extends to the dorsal and cervical regions of the cord, a similar difficulty and irregularity of motion are observed in the hands. The fingers imperfectly perform their office; their motions being irregular, slow, and difficult, and articles being held by them awkwardly and insufficiently. The movements of the arms are irregular or in jerks, so that the patient is either nearly or altogether incapable of feeding himself. He may continue in this state for months, or even years. One gentleman whom I attended was nearly, as now described, for seven or eight years, experiencing various exacerbations, but always suffering more or less, the disease having all this time affected the whole spine to above the nape of the neck, and being attended, as it usually is, by spasmodic contractions in various muscles, and distressing constrictions around the abdomen and thorax. During this state of the malady, flatulence of the stomach and bowels, anorexia, costiveness, or marked irregularity of the bowels, incontinence of urine, dryness of skin, or occasional sweats, and aggravation of the symptoms during the night, or when warm in bed, are more or less experienced.

148. During the progress of the disease, the pulse may not be materially affected, especially when the lower regions of the cord are chiefly or solely affected. But when the membranes of the cervical portion of the spine are attacked, the pulse is often very slow, and the actions or impulse of the heart disordered. Palpitations are frequent when the dorsal region is more acutely implicated. Difficulty of deglutition, slowness, or irregularity of respiration, spasm of the muscles of the neck, with paralysis of one or both arms, or

irregular motion, or contractions of the arms, often supervene, particularly as the disease extends upwards to the cervical membranes. Ultimately the paralysis becomes complete, especially the power of motion, at first in the form of paraplegia, and, if not arrested, passes into incomplete or complete general *paralysis* (see that article, §§ 69. *et seq.*). With the progress of paralysis, impaired animal heat and nutrition, a disposition to form gangrenous sores in parts pressed upon, and the several phenomena described under that head supervene. At last the lesion of the membranes extend to the medulla oblongata and base of the brain, and life is terminated by asphyxia, or more slowly by coma, supervening on delirium. In some cases the chronic affection of the lumbar or dorsal spinal membranes, after a protracted continuance or even after a marked improvement of all the symptoms, is unexpectedly followed, or after evident causes, by an acute attack, extending upwards to the cervical region, or to the base of the brain, and more or less rapidly causing dissolution. Of this course of the malady, I have met with several instances. A few of these have been noticed under the article Paralysis, in the chapters on *Paraplegia* and *General Paralysis* (§§ 48—74.); others have occurred to me since that article was written.

149. *c. Chronic spinal meningitis following the acute*.—A medical friend was driven, after having been over-heated, during a cold night, to some distance in an open carriage. He was soon afterwards seized with pain in the lower dorsal and lumbar spine, with spasmodic contractions of the lumbar muscles, and with most acute pain and cramps in the lower extremities. I did not see him until several weeks after the commencement of this acute attack. He then complained of extremely severe rheumatic pains in the lower limbs, with increased sensibility of the surface, a nearly total loss of motion of the lower extremities, of tenderness on pressing the spinous processes of the upper lumbar vertebræ, of a girding sensation proceeding thence around the abdomen, with occasional cramps and paroxysms, of pains in the thighs, legs and feet. His bowels were costive; his urine was voided regularly; but it contained much of the phosphates. The disease was viewed as acute rheumatic inflammation of the membranes of the cord, which had passed into a more mitigated and chronic form; and it was inferred that coagulable lymph was effused between the membranes, the patient having continued paraplegic. Another medical friend, whom I soon afterwards attended, for some time with Dr. Watson and Sir B. Brodie, was similarly attacked. The urine was freely voided, but it abounded with the phosphates. In the course of our attendance, inflammation of the femoral veins supervened. This complication was, however, overcome; but the spinal disease became chronic. This case was also caused by exposure to cold after being over-heated, and was viewed as rheumatic.

150. *d. Chronic spinal meningitis; lymph between the membranes, partially converted into adipose substance.*—A female, aged about fifty, very corpulent, complained of pain in the dorsal spine, and loss of the power of motion in the lower extremities, with tenderness on firmly pressing on the spinous processes of the lower dorsal vertebræ, and with spasms of the muscles of the lower limbs. The loss of motion was gradual, was preceded by spasms and increased sensibility, and was more complete in one limb than the other, but it slowly became complete in both. There was no loss of sensibility. The bowels were costive, the urine was sometimes retained, but subsequently was often passed involuntarily. A distressing feeling of constriction around the abdomen was complained of. After some months the voluntary motions of the lower extremities partially returned, and the excretion of urine was more under command; but some time afterwards the pain in the spine extended upwards, the constriction being then referred to the thorax. One arm soon afterwards became partially paralysed, and she soon afterwards died of asphyxia. She had imputed her attack to exposure of her back to a current of cold air when insufficiently clothed; but her habits were very intemperate. On examination after death, the venous sinuses of the vertebral canal were remarkably congested with black semi-fluid blood. Coagulated lymph, partially organized, was effused between the dura mater and visceral arachnoid; and the more organized portions presented an adipose appearance, from the quantity of oil-globules they contained. The upper portion of the cord and medulla oblongata were very vascular, and surrounded by a turbid serum and recently effused lymph.

151. The inflammation in this case, after being limited for many months, in a chronic form to the membranes of the lumbar and dorsal portions of the cord, ultimately extended upwards in a more acute form to the membranes of the cervical medulla and the medulla oblongata; the effusion of lymph from the inflamed and congested membranes in these latter situations having been the more immediate cause of death. The oleaginous change, or approach to a fatty degeneration of the more organized portions of the coagulated lymph, observed in this case, was still more remarkable and complete in the following.

152. *e. Chronic spinal meningitis supervening upon prolonged jaundice; lymph effused between the membranes, and converted into a soft, adipose tissue in the dorsal and lumbar region.*—A lady, aged about fifty at her death, was attended by Dr. King, of Eltham, and the author, for jaundice, which had continued for several years, without having been materially influenced by treatment. She had, however, retained her strength, flesh, and spirits, and was able to go abroad daily, until nearly a twelvemonth before her death, when she gradually lost the motive power of her lower extremities, sensibility having been unimpaired. She had, previously to, and about the accession of, the palsy, complained of pain in the lower dorsal and lumbar spine, with constriction around the abdomen. The bowels were costive, but the excretion of urine was not materially affected. The menses were regular, and continued so up to two or three months before her death. The palsy had continued for many months, with a slight improvement during the latter months, when a few days before her death, and owing to mental and physical perturbation, signs of the extension of the spinal meningitis, in an acute form, to the cervical portion of the cord, and to the base of the brain appeared, with paralysis of the upper extremities, delirium, and coma.

153, On examination after death by Dr. King and two other medical men, in my presence, the dorsal and lumbar spinal membranes were found agglutinated by a substance, which presented an organization almost identical with adipose substance, but which, as it approached the upper portion of the dorsal region, presented more and more of the characters of firmly coagulated, or partially organized lymph; and, in the cervical region, as far as the base of the cranium, the lymph had the usual appearance of recent effusion, and was attended by a considerable accumulation of turbid serum. In this case, as well as in others where I have observed coagulated lymph many months after its effusion between serous surfaces, the conversion of it into an adipose, or rather into a cellulo-adipose tissue—a more or less fatty degeneration of the coagulated or organised lymph—had been effected, this conversion being in some respects a process of reparation, admitting of a partial return of the functions of the diseased parts (see *Of the Causes, Nature, and Treatment of Palsy, and Apoplexy.* By J. COPLAND, M.D., F.R.S. &c. London, 8vo. pp. 60. *et seq.*)

154. ii. INFLAMMATION OF THE SPINAL CORD. —*Myelitis*, from *μυελος, the medulla spinalis.*—*Myelite*, Fr.—*Markentzündung*, Germ.—Inflammation of the substance of the spinal cord may be *acute or chronic*, as observed in spinal meningitis, and it may occur primarily and simply, but it is more frequently associated with inflammation of the pia mater of the cord, often extending also to the visceral arachnoid. The frequency of these associations —the extension of the inflammatory action from the one structure to the other—and the circumstance that the disease rarely comes under the eye of the physician until it is advanced in its course, render the early history of myelitis difficult to be described. The older writers on medicine appear to have been unacquainted with this disease; and it is only since pathological anatomy was advanced by comparatively recent inquirers, that the disease of the spinal cord, and of its membranes, have received any attention, very much still requiring to be ascertained respecting the extent of function and the lesions of this part of the nervous system, and the signs and symptoms by which these lesions are manifested during life. Among the several writers of the present day who have noticed the diseases of the spinal cord, very few have endeavoured to distinguish the symptoms which are proper to inflammation of the cord, from those which more especially belong to inflammation of its membranes; and the signs, which some writers have assigned to the one disease, have been by others attributed to either.

155. *A. Acute Myelitis* commences, with or without chills or rigors, with acute, deep-seated pain in some portion of the spine that is much aggravated by motion. J. FRANK, however, says, that he has not observed this exasperation of the pain on motion. I have remarked it, but not always. The patient lies sometimes on the abdomen, sometimes on either side, but he cannot lie long on his back on a soft and warm bed. According to KLOHSS, this last position may be much longer retained on a hair mattress. The spinal pain is generally more or less limited in extent, and is attended by stupor, or numbness and prickings or tinglings in the corresponding muscles and limbs. The stupor is the more marked the more violent and rapid the inflammation, and the sooner terminates in more or less complete palsy. In some cases the patient cannot move his lower extremities, which are the seats of excessive pains, exasperated most acutely by the slightest contact. M. OLLIVIER and myself have seen the pain and sensibility so excessive as to render the contact of the bed-clothes unbearable. The retention of the fæces and urine is at first more or less complete, but their involuntary excretion is very common as the disease advances. In rare cases, or when the malady is very rapid, the alvine discharges are involuntary from the beginning. Occasionally, however, constipation continues throughout, and excretion of urine remains under the control of the will.

156. The paralysis consequent upon myelitis sometimes ascends from the lower extremities until it reaches the superior parts of the trunk, and even the superior members, causing death by affecting the respiratory nerves, and producing asphyxia. In rare cases, the disease proceeds in an opposite direction, extending from above downwards. In some instances, there is only loss of motion, sensibility being slightly or not at all impaired. In others, sensibility alone is abolished; and in several, there is loss of both motion and feeling to an equal extent. These differences are owing to the parts of the cord affected. It was formerly believed that the anterior columns, presiding over motion, were affected when motion was lost, and that the posterior, presiding over sensation, were affected when sensibility was lost. Several cases, however, recorded by RULLIER, STANLEY, WEBSTER, and others, prove either that the changes observed in the posterior columns of the cord have taken place at the moment of, or immediately after dissolution, or that sensation may be transmitted through other channels besides these columns, or even independently of the spinal cord itself. But this subject has been sufficiently discussed in the article PARALYSIS (see §§ 179, *et seq.*). It may, however, be here remarked, that in the cord, as in the brain, the white or fibrous structure may be more especially connected with motion, the grey structure with sensation and its several manifestations. Usually paralysis commences in a single limb, and afterwards extends to the opposite side. Sometimes spasms, contractions, or convulsions of various duration, precedes the paralysis. When palsy is complete, the limb is flaccid as well as motionless, but when less so, permanently contracted and painful.

157. Myelitis seldom is seated in the whole extent of the cord; much more frequently in a portion only, the symptoms generally indicating the seat. If it be in the vicinity of the annular protuberance, disorder of the senses, or furious delirium, or many of the symptoms of inflammation of the brain, and even hydrophobic symptoms, followed rapidly by general paralysis and asphyxia, are often observed. If the cervical portion is affected, there are pains in the neck, and generally rigidity of the muscles of the neck and of the upper extremities, which are sometimes convulsed or contracted, and at last paralysed. The palsy usually commences in one of these extremities only, and is preceded by numbness and prickings, at first at the points of the fingers, rising gradually, thence to the hand, fore-arm, and arm, and is soon replaced by loss of motion, and often

also by more complete loss of sensation. Respiration is generally laborious, painful, anxious, and performed chiefly or only by the diaphragm. M. Ollivier and myself have observed difficulty of deglutition at an advanced stage, this function being often painful also, especially when swallowing fluids. Singultus is also sometimes observed.

158. When the inflammation is seated in the dorsal portion of the cord, or between the two thicker portions, giving origin to the nerves of the extremities, then continued or frequent succussions of the trunk of the body, not extending to the limbs, are observed. If the thicker portions of the cord are affected, the convulsive movements extend to the limbs whose nerves originate in these portions. Respiration is short, precipitate, and performed by the diaphragm: there are likewise palpitations, and strong, frequent or irregular action of the heart. To these symptoms, according to the younger Pinel, there are joined a nearly entire abolition of the functions of the nerves originating in this part of the cord, and a state of febrile excitation of the other functions. When the lumbar portion of the cord is affected, spasms or constriction, or contraction of the abdominal muscles, paralysis of the lower limbs, involuntary stools, or retention of the urine and fæces, with deep-seated pain in the lumbar spine, are observed. Sometimes priapism occurs, especially when myelitis is caused by a fall or injury. The *duration* of acute myelitis may vary from three or four days to as many weeks; and various febrile and sympathetic phenomena may attend individual cases; as vomiting, singultus, dyspnœa, delirium, morbid states of the urine, and a disposition to bed-sores, especially in the more prolonged cases, &c. (see art. Paralysis, §§ 64. *et seq.*).

159. *B.* Chronic Myelitis may follow the acute, which, owing to treatment or other influences, may become chronic and slight, or subacute and ultimately chronic; or it may commence in a slight and chronic form, and after an indeterminate period, becomes more or less acute and rapidly fatal. The symptoms are chiefly a less intense state of those characteristic of the acute. There are generally pain, more or less slight or severe, in some part of the spine, and pains or cramps in corresponding muscles or limbs, for some time before loss of sensibility, or of motion, takes place. The paralytic symptoms may, however, be preceded by so little suffering as not to interest the patient, or come under the cognizance of the physician. There is seldom much tenderness upon pressing the spine, or increase of pain upon percussion of, or when pressing, the spinous processes. After a time, and sometimes without much previous disorder, simple diminution of sensibility or of the power of motion is experienced. This increases slowly. The patient is subject to tremor. The gait becomes uncertain, staggering, or tottering. He lifts and directs the extremities with difficulty, and uncertainty. Ultimately the limbs no longer can support the body. Involuntary startings of the muscles, subsultus, or rigid contractions of muscles or limbs occur. The paralysis ascends to the trunk, affects the excreting functions, and implicates in some degree the circulating and vital functions. The pulse becomes slow, irregular, or weak; the limbs flabby, œdematous, and cold; sloughs form on parts which sustain pressure. The urine is morbid, retained, or passed involuntarily, abounding in the sulphates and phosphates; and ultimately dyspnœa, coma, and death by exhaustion or by asphyxia takes place.

160. *C. Appearances in fatal cases of Myelitis.*— These consist chiefly of red softening of the cord in various degrees. It may extend through all the columns of a small portion of the cord, or along a large portion, and it may vary from a slight diminution of consistence to complete diffluence of the structure. It may affect only one or more columns, or it may be limited to either the white or to the grey structure, or it may extend to both. The softening is often yellowish, or presents merely a slightly red or pinkish shade. The changes in the cord may exist alone, or be associated with inflammatory changes in the pia mater and visceral arachnoid; much more rarely with changes between the dura mater and visceral arachnoid.

161. Rokitansky remarks that, in the cord, as in the brain, inflammation attacks sometimes the white structure, sometimes the grey substance, occasionally both together. But myelitis of the grey substance exists in long streaks, or in the whole extent of this substance, restricting itself to this structure, and producing a peculiar condition of the cord, as well as the increase of volume, which attends softening, and a peculiar form of dropsy, in which it occasionally terminates. Red softening of the grey substance is tinted according to circumstances, of a chocolate brown, or plum colour, or rusty brown, or yeast-yellow, and corresponds with the central softening of the spinal cord, described by Albers. In *chronic cases* of myelitis, yellow softening of the columns, and condensations or indurations in various grades and extent, have been observed. Indurations, conjoined with atrophy, chiefly of the white columns, have also been remarked.

162. M. Calmeil, who has paid much attention to diseases of the spinal cord, states in relation to the comparative frequency of softening in the different regions, that, in twenty-five cases, six existed in the cervical region, eleven in the dorsal region, five in the dorso-lumbar, and two in the lumbar. In one case only was the organ softened throughout. In one instance, the left half of the cord only was softened; in two the anterior columns were alone thus altered. The softened nervous structure preserved its natural colour in ten cases. It presented a yellow tint in six; a rose tint in four; a red colour in three; and a brown hue in one. The softened molecules were mingled with blood-globules in one. The pia mater was brown in one case; was injected and red in seven, and covered by false membranes in two instances. It may here be remarked, that the white and yellow softening does not necessarily proceed from inflammation; but as it gives rise to nearly the same symptoms as the inflammation, the difficulty of separating them is great.

163. iv. Diagnosis.—*A.* It is of much importance to distinguish between *rheumatism* and inflammation of the spinal cord or of the membranes. The pain both in the spine and in the corresponding nerves, or in muscles supplied by these nerves, will not be mistaken for primary rheumatism if this very correspondence be attended to, and if the girding or sense of constriction in the corresponding situations of the trunk be considered.

The history of the case will also assist the diagnosis. It should, however, be recollected, that rheumatism may either extend or occur as a metastasis to the membranes of the cord. This has been supposed to be a very rare occurrence; but, according to my experience, although not frequently observed, it is by no means rare. When, however, it takes place, it is essentially inflammatory, assuming the sub-acute or chronic states of spinal meningitis, and hence no distinction is to be made between them in nature or treatment. It is only when rheumatism, in its usual forms, attacks parts in the vicinity of, or in nervous connection with, the spine, that the diagnosis is of importance. The spasms, the deep-seated burning sensation in the course of the spine; the tonic contractions of the muscles of the back, curving the trunk backwards; the altered sensibility of the surface, with numbness or prickings in the extremities; the stupor or loss of motion will distinguish spinal meningitis and myelitis from rheumatism, which is unattended by cramps or tonic spasms, or by the constrictions or girdings of the trunk already mentioned. In the former, also, pressure or percussion, or pressure conjoined with heat, over the spinous processes, sometimes increases pain; but in the latter, pain is increased by pressure on the sides, or in the vicinity of these processes, and by motion of the affected parts.

164. *B.* The diagnosis between *spinal meningitis* and *myelitis* is much more difficult, inasmuch as the former generally influences more or less the functions of the cord, and inflammation of the visceral membranes of the cord is often associated with myelitis. Spinal meningitis, however, has a marked disposition to extend itself, and is frequently complicated with cerebral meningitis, especially in children, whilst myelitis is generally limited to a portion of the cord only. Acute spinal meningitis may, with much certainty, be inferred from three symptoms: the first is a general contraction of the muscles of the back, varying from simple muscular rigidity to violent spasm, or tetanic rigidity, occasioning complete opisthotonos. In meningitis of the base of the brain, the head is thrown backwards, or the cervical portion of the spine is sometimes retracted; but the trunk preserves its form. The second symptom is the violent pain extending more or less along the whole spine. The third is the continuance of sensibility even of the limbs, although motion may be abolished by the pressure of effused lymph on the cord and roots of the nerves.

165. The febrile symptoms are more marked or more severe in spinal meningitis than in myelitis; and paralysis of motion either does not occur, or not until effusion disorders the functions of the cord, or until inflammation extends to the substance of it. In myelitis the pain is not so severe; and the most remarkable symptoms are, impairment or loss of motion, and diminution of sensibility. In chronic myelitis, the membranes often become similarly, or even acutely affected, the symptoms most characteristic of both spinal meningitis and myelitis being present.—*Spinal Apoplexy* (§§ 192. *et seq.*) is to be distinguished from both these diseases by the sudden accession of the severe symptoms, and by the rapid occurrence of the paralysis of motion, and generally also of sensation.

166. v. Complications.—Spinal meningitis may be associated with myelitis, and, in such cases, the symptoms of the one will be accompanied with those of the other. This complication is often a consequence of severe injuries; retention of urine, priapism, paraplegia, &c., frequently being present, according to the seat and severity of the injury (see art. Paralysis, §§ 50. *et seq.*). One or both these diseases may be further complicated with inflammation or caries of the vertebræ, or of the intervertebral substance; or with aneurism of the aorta, or with spinal apoplexy, or with some one or other of the organic changes implicating the spinal cord or its membranes, about to be noticed (§§ 178. *et seq.*). Spinal apoplexy, when it fails of producing death in a very short period, is generally followed by spinal meningitis or myelitis, according to the seat of the sanguineous extravasation. The complication of spinal meningitis with cerebral meningitis has been sufficiently noticed above (§§ 138. *et seq.*).

167. vi. Prognosis.—*A. Acute spinal meningitis* is a dangerous disease, and the association of this with cerebral meningitis is still more dangerous, although not necessarily fatal when actively treated at an early stage. Chronic spinal meningitis, when it has advanced so far as to cause paralysis, is seldom altogether removed; but the symptoms, both paralytic and spasmodic, may be considerably ameliorated, whether it has occurred as the primary malady, or followed the acute. At all periods during the course of chronic spinal meningitis, an acute extension of the disease, generally upwards to the base of the brain, may occur, especially upon exposure to any of the causes of the malady, or even after any physical or mental perturbation, and carry off the patient. I have observed this to take place in chronic cases, even of ten or twelve years' continuance. In some cases, the disease may advance slowly for many years; in others, it may be stationary for as long a period; and in a few, an amendment more or less considerable takes place. It is chiefly before the supervention of paralysis that treatment is most efficacious; and even in this early period the best devised means often fail: much depends upon the constitution, habits of life, and previous ailments of the patient. Whilst writing this, a gentleman whom I attended nine years ago for acute spinal meningitis, affecting chiefly the cervical and dorsal regions, called upon me. He had been seen also by Drs. Chambers and Bright, in consultation with myself. His habits had been irregular, and the acute attack passed into the chronic, with paralysis of motion, which was more remarkable in one side than the other. The painful symptoms have long since ceased, and the paralysis is considerably less.

168. A lady, aged about forty, and very corpulent, was seized with acute spinal meningitis and suppression of the catamenia. She had had several children. The disease had existed three or four years when I was requested to see her. Paralysis of motion was complete from the neck downwards, but sensibility was not impaired. Her spirits were good, and she still retained considerable power over the alvine and urinary excretions. She possessed only a very slight power of motion in one arm. Treatment similar to that about to be advised for the chronic form of the disease (§§ 173. *et seq.*) was prescribed. She recovered gradually: could use both hands, and walk abroad.

She went on the continent; after some time she proceeded to the north of Scotland to the family seat, and continued in comparatively good health for a long time. She had, whilst at her residence in the north, what was supposed to have been an attack of fever, of which she died. It is more probable, from the presence of cerebral symptoms in her case, that an acute extension of spinal meningitis had supervened, and implicated the membranes of the base of the brain, and thereby proved fatal, as I have uniformly observed when the malady was thus extended.

169. A respectable tradesman complained of chronic spinal meningitis, consequent upon a fall on the lower part of the back, attended by partial paralysis of motion in both lower extremities, and constriction around the abdomen. I saw him occasionally for some years, during which time he was able to walk about with the assistance of a stick, or of the arm of a servant. After a time I was requested to see him, and was informed that he had called to his aid an irregular practitioner, who had confidently promised to cure him, and that he soon afterwards became much worse, complaining of spasms, and of severe pain along the whole course of the spine. He was delirious and generally paralysed when I now saw him; but was soon afterwards comatose. A gentleman, aged about forty, gradually became affected, as described under the head of chronic spinal meningitis (§§ 159.). Sensibility was not diminished, but voluntary motion was remarkably impaired in all his limbs. The bowels were always costive, and the power of retaining the urine was very much lessened, and ultimately lost. Still a full dose of opium or morphia enabled him to retain it from six to ten hours. He lived in this state for about twelve years. He afterwards became much worse, was feverish, delirious, and comatose, in succession. I examined the body of both these persons after death, and found the changes, as already described (§§ 160.). The spinal cord appeared somewhat atrophied. Recent inflammatory appearances were observed in the membranes of the base of the brain and medulla oblongata in both.

170. *B. The prognosis of myelitis,* when *acute,* is generally most unfavourable, death often taking place in a few days, even although the treatment may have been both prompt and judicious. The *chronic* form is less unfavourable. It may continue for months, or even years, when limited in extent; or the patient may even recover partially. In these cases, it may be inferred, that the resulting lesions have either been slight, or at least partially removed, so as to admit of the continuance of life for an indefinite period. An exasperation of the disease is, however, apt to take place when exposed to causes of physical or mental perturbation. Although but little hope can be entertained of effecting a cure, when confirmed paralysis exists, yet we may be more sanguine as to the result at any early stage. When, however, the powers of life are evidently sinking; or when the urine is very morbid in its constitution, or as regards the functions of excretions; or when the influence over the sphincters is lost, or especially when sloughs form on parts which sustain the pressure of the body, then hopes of sustaining life much longer cannot reasonably be encouraged. The danger is always greater when the cervical or dorsal portions of the cord are affected, than when the lumbar region is attacked.

171. vii. Treatment.—The treatment of inflammation of the membranes of the spinal cord, and of the cord itself, varies much with the acuteness, the duration, and the special characters of individual cases, and with the constitution, state, and circumstances of the patient.—*A. Acute spinal meningitis* requires very prompt and energetic means; for, if the disease proceeds so far as to occasion its usual changes, the best devised means will often prove inefficacious. Bloodletting, general or local, or both, according to the habit of the body, strength, and age of the patient, is necessary, especially very early in the attack. The amount as well as the repetition of the bloodletting, should depend upon the circumstances just mentioned; but I have generally preferred the application of cupping-glasses along the spine, followed by terebinthinate epithems or embrocations. The bowels should be freely evacuated; and this intention may be accomplished by the immediate administration of a full dose of calomel, or of calomel and James's powder; and within a few hours afterwards by the infusion of senna, or other aperients, which ought to be repeated until the desired effect is produced. Terebinthinate enemata are always beneficial, not merely in procuring a full evacuation of the bowels, but also in presenting the changes usually following acute inflammation of serous membranes; and hence the spiritus terebinthinæ may be given with benefit by the mouth; for when thus exhibited, and in such a mode as will not excite vomiting, it is more certain and prompt in preventing the effusion of lymph from these membranes, than the free administration of mercury.

172. Besides the above, various other means have been advised by writers, especially very deep incisions on each side of the spinous processes by Goss; the cold affusion, or the application of ice, along the spine by Ollivier, and the warm or vapour bath by others. Cupping and scarification, or dry-cupping, when the former is no longer required, should be preferred to the first of these; the benefits or the effects produced by the second have not been shown, and the advantages produced by the third are very equivocal. Warm pediluvia and manuluvia, salt and mustard, having been added to the water, are generally of service. But after the satisfactory operation of the means advised above, the due consideration of what should be avoided may be of more service than the employment of means of doubtful efficacy. The patient should lie on a hair couch, on either side, so as to keep the spine moderately cool, and allow the application and renewal of such agents to it as have been advised. Vomiting, straining at stool, and motion, should be prevented as much as possible; and if the urine be not duly evacuated, it should be drawn off frequently, care being taken not to allow an accumulation of it in the bladder for any considerable time. Cooling diaphoretics or refrigerents are always of service as long as febrile symptoms continue. Blisters are rarely of service, but are oftener productive of irritation of the urinary passages. Terebinthinate epithems or embrocations, such as I have advised in various parts of this work, or a combination of these with opium—the tincture, wine, &c.—

are very frequently of use, and may be repeated daily, or twice in the day. If the pain and sympathetic affections of spinal meningitis continue, notwithstanding the means above prescribed, the tincture or extract of *aconite* will often prove of much service, when exhibited in sufficient doses.

173. *B.* If *chronic spinal meningitis* either follow the acute or occur primarily, certain of the means already mentioned may be cautiously employed. In some instances, scarification and cupping, or dry-cupping, or a repetition of these, may be still resorted to, especially at an early stage of the primary chronic, or during the insidious commencement of the disease. The intestinal and urinary evacuations always require attention. Various counter-irritants have been advised, especially blisters, issues, moxas, setons, tartar-emetic ointment, the actual cautery, &c. I have very rarely seen either blisters, or setons, or issues, or the tartar-emetic ointment, of any service in this state of the disease. Of moxas and the actual cautery, I have not had sufficient experience. Dr. Bennett states, that he has seen the latter agent produce a cure in two cases of chronic spinal meningitis occasioned by diseased vertebræ. It is most probably in this complication, that the actual cautery, setons, issues, and moxas are most likely to be of benefit. In other circumstances of the disease, the terebinthinate embrocations or epithems along the spine, or the frequent sponging of the surface of the spine with a strong solution of bay salt have been more serviceable, according to my experience, than either of these.

174. In chronic spinal meningitis, I have not found lowering measures of much service, especially when far advanced or of long standing; and when it has produced paralysis, owing to the changes consequent upon inflammatory action, I have generally prescribed such means as seemed most likely to support vital resistance to the extension of the disease, and at the same time to remove the structural alterations which may have already been produced. With these views I have given small doses of the bichloride of mercury, with hydrochlorate of ammonia, and either the decoction or the tincture of cinchona, and the fluid extract of sarza; and after this combination has been continued for a considerable time, but with strict reference to its effects, I have substituted the iodide of potassium and the carbonate of potash, or liquor potassæ, or Brandish's alkaline solution, for the bichloride and the ammonia, the other medicines being continued in conjunction with the iodide and fixed alkali.

175. *C. The complications* of either the acute or the chronic state of spinal meningitis clearly demand means such as have been advised. When acute cerebral meningitis is associated with the spinal disease, the best devised means are generally inefficacious, but those already prescribed appear the most appropriate. The complication of chronic spinal meningitis with rheumatism requires the same indications of cure, and similar means to those noticed above (§§ 171. *et seq.*). But in this state of the disease, as well as in certain other chronic complications or forms, medicated warm baths, especially such as contain stimulating substances, deserve a cautious trial; and if they be found of the least service, they should be sufficiently tried. In one case in which the spinal malady appeared in the course of very prolonged jaundice (§ 152.), the more severe symptoms were somewhat mitigated, notwithstanding the persistence of the primary disease. The association of spinal meningitis with disease of the vertebræ, or of the cord itself, has been treated by me, according to the principles now enunciated; and I have no experience of any other means, than those already noticed, which appear to be of any service in those or other complications of the malady.

176. *D. Acute Myelitis* requires similar means to those already advised for acute spinal meningitis; but, even at an early stage, vascular depletion is not so beneficial, and admits not of being so freely employed in the former as in the latter. The other means, especially the internal medicines and the external applications, particularised above, may be resorted to. In addition to these, urtication, warm baths containing stimulating and rubefacient substances, anodyne and terebinthinate embrocations along the spine, and the preparations of aconite when spasm or pain is urgent, may severally be employed. The paralytic symptoms, which are generally much earlier and more complete in myelitis than in spinal meningitis, may be combatted by the bichloride of mercury, or by the iodide of potassium, and the other remedies, as combined above (§ 174.). The preparations of *nux-vomica* or *strychnine* have been recommended, and too frequently and injuriously employed in these cases. In all cases which may be inferred, from the mode of attack, or from the characteristic symptoms, to be either acute or chronic myelitis, we have few, and oftener no, means of ascertaining the nature of the changes which have taken place in the cord and its membranes; and hence those preparations, especially strychnine, which excite or irritate the spinal cord, should, if prescribed at all, be exhibited with great caution.

177. *E.* In the more or less *chronic* states of myelitis, various means have been tried, but rarely with more than very temporary relief. In these states especially, the preparations of nux vomica, of strychnine, of arnica, phosphorus, &c.; electricity, galvanism, electro-magnetism; frictions, with various stimulants and irritants, and external derivatives, may severally be resorted to, according to the peculiarities of the case, but they require both discrimination and caution. It is only in the more protracted cases of either myelitis, or spinal meningitis, where the symptoms indicate passive, rather than active disease—when neither acute nor painful symptoms are present, that these means should be employed. Farther remarks on the use of these and similar means, will be found in the article Paralysis (see §§ 244, *et seq.*), and in my work on *Palsy and Apoplexy* (see p. 397. *et seq.*).

VIII. Structural changes of the Spinal Cord and of its Membranes.

Classif.—IV. Class.—III. Order (*Author*).

178. i. Morbid states of the Spinal Membranes.—The *dura mater* of the spinal cord is unprovided with the granulations called Pacchionic glands. It is not so firmly attached to the bones as that of the brain, and the arachnoid and pia mater are more loosely united to the cord than these are to the brain. Owing partly to these circumstances, diseases of the spinal bones less frequently affect their contained structures, than those of the cranium.

179. *A.* The membranes of the cord are sometimes *distended* by fluid, *discoloured*, and present various grades of *consistence*, but not so frequently as those of the brain. *Irritation*, vascular *erethism*, and *congestion* often are observed, especially in continued fevers, in the exanthemata, in tetanus, in rabies, in spinal epilepsy, convulsions, gout, rheumatism, &c.; but these are not to be confounded with true *inflammation*, which, however, may occur as an epi-phenomenon in these diseases. All the alterations consequent upon inflammation of the membranes of the brain are observed after spinal meningitis, as effusions of *plastic lymph*, or of *serous*, or *sero-albuminous* or *puriform fluids*, *thickening*, *induration*, *agglutination*, and partially organised *adhesions* of the membranes, *cartilaginous* and *ossific deposits*, and much more rarely *ulceration* and *mortification*. *Tubercular* formations, *tumours* of various kinds, *cancer*, and *hydatids* have also been found in these membranes on rare occasions.

180. *B. Morbid or effused fluids* are usually contained in the more external sac formed by the arachnoid membrane; but sometimes, as in the brain, between the arachnoid and pia mater; occasionally also between the dura mater and the bony parietes of the canal. Admitting that a limpid serum naturally exists between the spinal membranes, yet an inordinate, as well as a morbid effusion, is not infrequent, particularly in tetanus, epilepsy, some fevers and eruptive diseases, paraplegia, epilepsy, chorea, &c. The more morbid effusions between the membranes are, that of *air*, (Ollivier, Briere, Otto, &c.); large *collections of water*, dropsy of the spine, *hydrorrhachis*, either in an acute or chronic form: it may take place alone, or in conjunction with dropsy within the head: when great it usually produces universal palsy, owing to its pressure on the cord: *puriform matter*, proceeding from ulceration of the spinal marrow, or of its membranes, as in bedridden persons; or from the cavity of the skull (Denmark, Otto); or from carious vertebræ, as well also as effused from abscesses in the vicinity (Brodie, Velpeau, Jackson, &c.); *albuminous lymph*, or a *coagulable* and *organisable matter*, exuded by inflammation of the membranes, or by metastasis of rheumatism to them, as observed also in paraplegia, general paralysis, and in some cases of chorea (Copland and Prichard); and *lastly*, a *bloody fluid* or *pure blood*, liquid or coagulated, arising from injuries of the spine, from concussions of the trunk, from the breaking of an aneurism of an adjoining vessel, as of the aorta, or spontaneously from disease of the spinal vessels, or from some internal cause (Howship, Ollivier, Chevalier, &c.).

181. ii. Morbid states of the Spinal Marrow.—*a.* The *size* and *form* of the spinal cord vary materially. They generally correspond with the length and form of the spinal column: the cord may be too long or too short, in proportion to the rest of the body. Sometimes it is congenitally *thinner* or smaller, either in parts or throughout, especially in monsters with deficient or distorted heads and limbs. But it is subject to a morbid diminution of size—a true *atrophy*, as in *tabes dorsalis*—dorsal consumption. In this latter case, it is sometimes wasted more in one place than in another, being apparently indented and knotty. Atrophy is most frequently met with in extreme old age—*atrophia medullæ senilis*; in protracted cases paraplegia and general palsy; and in the lumbar region of the cord as a consequence of loss of the generative power, and of spermatorrhœa. It often extends upwards along the cord. It may also arise from the effusion of lymph between the membranes—of this association I have met with several instances—in chronic spinal meningitis consequent upon rheumatism, and in connection with chorea. In some cases the diminution of volume is associated with a dirty whiteness and toughness of the fibrous columns, and with a rusty-brown or fawn tint of the grey substance. In other instances, the cord is not only thus discoloured, but also infiltrated with serum, soft and withered (Rokitansky).

182. The cord may be more or less *thin* in parts, from *compression* by the adjoining bones, or by invasion of the canal, by thickening of the intervertebral substances, by bony concretions, by varicose states of the spinal vessels, by aneurisms of the vertebral arteries, by effused blood or other fluids, by hydatids, or by tubercles, or by cancerous or other tumours. The pressure of either of these may be such as almost to divide the cord, or to reduce the pressed part to extreme thinness.

183. The cord may be unnaturally *long* in newborn infants. Béclard found it to descend to the tail-bones in two children born with tails. Extreme *thickness* at certain parts is only congenital; but a portion of the chord may be morbidly swollen, owing to either extreme congestion, or effusion of blood (apoplexy of the cord), or of pus, or of other fluids, in its substance. The *form* of the spinal marrow is most commonly affected by *dropsy* or *hydrorhachis*, also called cleft spine, or *spina bifida*, when connected with an open state of the vertebral canal. This is naturally a congenital malady, associated with cleft of the spinal canal, and often also with internal dropsy of the head, hemicephaly, and hydrencephalocele. It generally terminates fatally with paralysis. But cases have occurred of children living many years with the disease, and even reaching puberty. Paletta and Acrel met with it at seventeen years of age; Henderson at eighteen; Apinus, Warner, and Hochstetter, at twenty; and Camper at twenty-eight. I saw a case of it, with immense tumour in the loins, in a female of about twenty. In rare instances, dropsy of the spinal cord has occurred after birth, and even in adults. This change, in connection with the state of the spinal marrow, is more fully described in the article Dropsy (see *Dropsy of the Spinal Cord*, § 178.).

184. *b. A rupture* or rather *protrusion* of the spinal marrow may occur from *hydrorrhachis*, so that, being itself expanded by the water, or compressed between the membranes by this fluid, it may be more or less protruded through the cleft in the spine, thus forming a *rupture of the spinal marrow* (*hernia medullæ spinalis*). In very rare cases, the chord may deviate from its natural position, in consequence of caries of its bony walls (Ferro, Lecat, Phillip, and Richter). The *colour* of the spinal chord may vary, as that of the brain, but very seldom without change of structure, excepting in some rare instances of jaundice.

185. *c.* The *consistence* of the marrow is more liable to vary. It may be *simply softened*, without

further change, or it may be softened with change, of its intimate structure, forming the *pulpy degeneration* described above (§ 160.), and when treating of the BRAIN (§§ 71. *et seq.*). Its structure may be even entirely broken down: it may be almost liquid or diffluent, or this state may present a mixture of blood. The broken-down state, either with or without blood being effused or infiltrated in the part, may exist only in spots, or in a considerable portion of the cord, and is to be ascribed to diseases which destroy its cohesion, especially inflammation, suppuration, watery infiltration of the substance of the part, and to a morbid or deficient state of its nutrition. Paraplegia more or less complete, or paralysis more or less general, is the usual result of softening; and pulpy degeneration of the cord.

186. *d.* On the other hand, the structure of the cord may be *too firm*, or even *hard*. This state is sometimes conjoined with diminution of size or atrophy in dorsal consumption, and with thickening after chronic inflammation. PORTAL, BERGAMASCHI, ESQUIROL, BIRCH, VELPEAU, and OLLIVIER, have found different portions of the spinal marrow nearly as hard as cartilage, particularly in epileptic, insane, and paraplegic persons. GENDRIN has observed the same cord very hard in one part, and very soft in others.

187. *e.* The *continuity* of the structure of the cord may be destroyed by disease, as by extreme pulpy degeneration, by the *laceration* occasioned by the effusion of pus or of blood, and by concussion of the spine. This lesion is, however, more commonly occasioned by wounds, violent extension, fractures and dislocations of the vertebræ. In some of those cases, the marrow protrudes through the opening in the pia mater. Small wounds of the cord may, in some cases, heal.

188. *f. Inflammation of the substance of the cord.—Myelitis* (§§ 154.) is, in some instances, an idiopathic disease, and in others, it results from external injuries and diseases of the surrounding structures. Inflammation is to be distinguished from congestion of this part, both in respect of their characteristic appearances, and of their usual consequences. Inflammation may appear in the slightest form of *vascular irritation*, unaccompanied by any very marked change of structure, as in many fevers, eruptive diseases, rabies, epilepsy, convulsions, trismus, tetanus, painters' colic, chorea, in all which the spinal marrow may be more or less affected. This organ may be more unequivocally inflamed either primarily or idiopathically, or consecutively and contingently, especially in the course of some cases of the above diseases. When truly *inflamed — myelitis* — the substance of the cord exhibits a rose-red colour, with some deeper-coloured or dusky spots and streaks, with enlargement of its minute vessels, and injection of the pia mater surrounding the part. In some cases, there is a distinct swelling, and generally some change from the natural consistence, namely, softening, or complete disorganization, or dissolution into a semi-fluid, discoloured by, or mixed with blood. In rarer cases, the inflammatory appearances are accompanied with hardening. Myelitis seldom terminates in *true suppuration*. In rare instances, small abscesses have been found in the cord. *Gangrene* is still more rare. *Ossific deposits*, or *bony concretions*, which are sometimes found in the membranes (§ 179.), do not seem to form in, or even to invade the structure of the cord.

189. *g. Congestion* of blood in the spinal cord may be consequent upon, or conjoined with a varicose state of the veins, or with congestion of the venous sinuses of the vertebral column; and the congestion when extreme, and especially when connected with atheromatous or fatty degeneration of the vessels (see art. ARTERIES § 59., *and my work on Palsy and Apoplexy*, pp. 266. 288.), many terminate in *effusion of blood* in the substance of the cord, or between the membranes, or external to the dura mater, and between it and the walls of the canal (ABERCROMBIE), owing either to rupture of the diseased vessels, or to sanguineous exudations from them, produced by certain obvious causes, or occurring spontaneously, and without any assignable cause — *apoplexy of the spinal cord.*

190. *h. Hæmorrhage into, or from, the spinal cord*, according to the seat of the vessels whence it proceeds, may exist between the pia mater and the arachnoid — in the internal sac of the arachnoid; and, when thus seated, there being no laceration of the structure of the cord, it may be inferred that the blood has proceeded from the vessels of the pia mater. In most cases of hæmorrhage into the substance of the cord, the effusion has taken place in the grey substance, and has even been infiltrated to a great extent along the internal canal of its axis (CRUVEILHIER, *Anat. pathol. Livr.* 3d). Circumscribed extravasations are also found in the structure of the chord, the blood effused undergoing the same changes as described in cerebral apoplexy, and the surrounding nervous tissue also presenting similar alterations (HUTIN, STROUD, GAULTIER, GRISOLLE, BENNETT, &c.).

191. iii. APOPLEXY OF THE SPINAL CORD. — *Hæmorrhage may take place into the external sac of the arachnoid—between the dura mater and arachnoid; or into the internal sac of the arachnoid, or between the pia mater and arachnoid.* When thus seated, the hæmorrhagic effusion has been called *Hæmatorachis* by OLLIVIER. *When the hæmorrhage occurs into the structure of the cord*, it has been termed *Hæmatomyélie* by this writer.

192. *A.* The *causes of spinal apoplexy* are chiefly injuries sustained on the spine, especially blows, falls, fractures, concussions, &c. Spontaneous hæmorrhage in either of the situations just specified, or *between the dura mater and the walls of the vertebral canal*, is rarely met with; and when observed, is to be attributed chiefly to pre-existing disease of the vessels (§ 186.); extreme exertion or efforts of any kind, or unusual demands made upon the circulation of the cord, or whatever interrupts the return of blood from or through the vertebral sinuses, being the more immediate or exciting causes.

193. *B.* The *symptoms* of spinal apoplexy have been imperfectly observed, owing to the rarity of the disease, and to the early progress of it having passed unobserved by competent persons. The mode of attack necessarily varies with the seat and amount of effusion. The most frequent phenomena characterising the attack are, pain, sudden and acute, in the region of the spine corresponding with the seat of extravasation, convulsions and paralysis. Precursory shivering and pain are sometimes ex-

perienced shortly before the complete or severe seizure. M. Calmeil adduces several cases to prove that, when the hæmorrhage takes place between the membranes, the pain is always acute, and is attended by convulsions or spasmodic contractions, paralysis being slight, or absent, unless the hæmorrhage is very considerable; and that, when paralysis of motion, or of motion and sensation, is sudden and more or less complete, convulsions being slight or absent, the spinal cord is then itself the seat of extravasation. When the hæmorrhage occurs in the cervical region, or in the upper part of the dorsal region, then priapism is generally present, as commonly also observed when these parts of the cord are injured by dislocations or fractures. Constipation and retention of urine are observed at first, and these may be followed, if the disease be not quickly fatal, by loss of power over the sphincters; these symptoms, however, depending much upon the seat and amount of hæmorrhage. When the effusion occurs in the higher regions of the cord, paralysis of the muscles of respiration soon supervenes, owing either to the amount of effusion, and in this case, death quickly supervenes, or to the changes consequent upon the effusion, and then this issue is longer in occurring. The changes may extend upwards, even when the hæmorrhage is low in the spine, and cause death by paralysis of the respiratory muscles, and asphyxia. The following case, recorded by Mr. Curling, will illustrate the symptoms and appearances after death of this malady:—

194. A gentleman, aged forty-four, a stout man, of active habits, but a free liver, and subject to gout, had just got into bed about 11 p.m., when he was suddenly seized with spasms in the stomach, and found that he had lost all sensation and power of motion in the lower half of the body. An hour after this seizure, the patient was found shivering in bed by Mr. Curling, with complete paraplegia of the whole of the body below the third ribs, and strong priapism. He had perfect use of the arms, but complained of pain about the wrists. No excito-motary actions were producible. His mind was quite clear. After the circulation was restored, the treatment consisted chiefly of cupping between the shoulders, a blister at the nape of the neck, purgatives to unload the bowels, frequent doses of calomel, and regular relief of the bladder. The priapism subsided in about twenty-four hours. There was no extension of the paralysis, except numbness in the hands, and at last imperfect power of using them. During the first eighteen hours after the attack, scarcely any urine was secreted, and it subsequently continued scanty in amount. The breathing gradually became embarrassed and difficult, and the patient died the fourth day after the seizure, his intellect being unaffected until within a few hours of his death.

195. On examination after death, the muscles of the back were much loaded with blood. No fluid escaped on opening the theca vertebralis, the head being in a depending position. The vessels on the surface of the cord were very congested. An incision was made along the front of the medulla, commencing at the part corresponding to the third cervical vertebra, and terminating at the last dorsal. There were two small clots of blood, amounting together to about a drachm, in the interior of the medulla, occupying about an inch and a half in extent, and situated between the origins of the second and third pairs of dorsal nerves. The substance of the cord around the clots was somewhat soft. The medulla was more or less infiltrated, and stained with blood from the site of the clots, upwards as high as the third cervical vertebra, and downwards as low as the last dorsal. (*Third Report of the Proceedings of the Pathological Society of London*, p. 28.)

196. *C.* The *diagnosis* of the lesion, when marked, is not very difficult. The suddenness and severity of the pain, of the spasms, or of the paralysis, and the degree of constitutional or vital shock which ushers it, distinguish it from other spinal affections, and prevent it from being mistaken for rheumatism, with which slighter and more gradual attacks may be confounded. The priapism, where the upper portion of the cord is the seat, and the states of the excretory functions, further aid the diagnosis.

197. *D.* The *prognosis* is always most unfavourable when the attack is such as to admit of a confident diagnosis. But the issue may be protracted, especially when the lower portion of the cord is the seat of hæmorrhage, and is then to be ascribed chiefly to consecutive changes, which may require an indefinite period to produce their ultimate effects. When the effusion is near the pons or medulla oblongata, or even when it is in the cervical region, and especially if it is of considerable amount, at any part of the upper regions of the cord, then death may occur immediately, or in a few hours, or in less decided cases, in a few days. M. Hutin found in the cervical portion of the cord two clots of blood. The person died during the night. When the hæmorrhage is very limited, restoration of the lesion, and even of the functions depending upon the seat of lesion, may take place. M. Cruveilhier states, that a medical student lived five years after a circumscribed hæmorrhage in the left side of the cervical portion of the cord. Loss of motion was experienced in the same side — in both the lower and upper left extremity. The patient died of a much greater hæmorrhage than the first, and the seat of that was found cicatrized, the blood having been absorbed, and the movements of the side gradually restored. This case shows, that hæmorrhage into the substance of the cord and the seat of hæmorrhage undergo similar changes to those observed in the nervous structures contained within the cranium — that apoplexy of the cord may be recovered from; remains of old apoplectic cysts, similar to those observed in the brain, having been met with in the substance of the cord, particularly in its cineritious structure.

198. *E.* *The treatment* of spinal apoplexy must be founded more upon the analogy of this disease with cerebral apoplexy than upon the results of experience. It may be directed with the following intentions:— 1st, to arrest, or to prevent a recurrence of the effusion; 2nd, to favour the absorption of the extravasated blood; and 3rd, to keep within due bounds the vascular reaction or irritation accompanying or following upon the process of reparation in the seat of injury. For these purposes, bloodletting, chiefly by cupping-glasses applied on the spine, according to the pulse and habit of body of the patient; terebinthinate epithems or embrocations along the spine; the

facial or lateral recumbent posture, perfect rest; attention to the secretions and excretions; frequent recourse to the catheter, if it should be at all required, and the earliest and utmost endeavours to prevent bed-sores, by recourse to air-pillows, the hydrostatic bed, &c., comprise the chief means that will be found useful in these seizures. Most other measures will either prove inefficacious or injurious, excepting such other means as have been advised for *myelitis* (§§ 171. *et seq.*), which may supervene upon the more limited or slight attacks of hæmorrhage.

199. iv. TUMOURS OF VARIOUS KINDS, DEVELOPED IN, OR NEAR TO THE SPINAL CORD, produce effects which terminate fatally, after having occasioned, for an indefinite period, paraplegia or general paralysis. The tumours, or morbid productions, or growths, which may implicate the cord or its membranes, are of various kinds; they may be formed either in the vicinity of the theca, or in the membranes, or even in the cord itself. Certain of these are developed exteriorly to the cord only, and others may even be primarily formed in it, although very rarely, as well as in its membranes, or in its vicinity. *Aneurisms* of the aorta may produce ulceration and absorption of the bodies of the vertebræ, and ultimately affect the membranes, or even the spinal marrow itself. *Hydatids* may produce similar effects.

200. *a. Cartilaginous productions* may invade the vertebral canal, or *exostoses* may form within the canal, diminish its calibre, and press upon the cord. In a case recorded by Mr. A. KEY, the ligaments covering the intervertebral substance between the second and third lumbar vertebræ, were hardened and prominent, projecting so far into the canal as to diminish it by one third of its diameter. The patient had lost the power of motion, but retained sensation of the lower extremities. In another case of loss of power of motion, numbness and tingling from the loins downwards, retention of urine, and imperfect command over the sphincter ani, were experienced, terminating in sloughing of the nates and death. "The intervertebral substance above the 12th dorsal vertebra, with the ligament covering it, presented a slight ridge, projecting into the medullary canal, as if an ossification from the edge of one bone tended to unite with a similar growth from the other edge. This transverse ridge manifestly narrowed the canal."

201. *b. Tumours*, fibrous, fungoid, or otherwise organised, malignant or non-malignant, may grow exteriorly to the vertebral canal, and may invade not merely the walls of the canal, but also the membranes and cord itself; or such tumours may commence in, or be attached to, the dura mater of the chord. *Tubercles* and melanoid and other *cancerous growths* are very rarely found in the spinal cord, although not infrequently seen in the brain. *Tubercle* occurs only in connection with tubercles in other organs, and chiefly in the cervical and lumbar regions of the cord, where it occupies the white fibrous structure, and sometimes the grey substance. As in the brain, so in the spinal cord, it occasions red or inflammatory softening, or yellow softening of the surrounding tissue. In some cases, several tubercles, not exceeding the size of millet or hemp seeds, are grouped together. In others, only one tubercle of the size of a pea or bean is found.

202. *c. Cancerous formations* are very rarely found in the cord, and even then chiefly in a secondary form, or in connection with similar productions in other parts. The very extensive experience of ROKITANSKY, furnished him with only one instance of true and primary cancer of the cord. But he has met with several instances of circumscribed callous induration of the white columns, of the cancerous nature of which he is in doubt. OLLIVIER mentions several examples of diffused carcinomatous growths implicating the spinal cord, as well as of so-called colloid cancer.

203. *d.* The *symptoms* produced by morbid growths and alterations of structure in the spinal cord and its membranes, or by tumours developed in the vicinity, are generally those which indicate a slowly increased pressure on the cord, or a slowly advancing interruption of the functions of this organ. They are rarely such as enable us to distinguish the nature or the particular kind of lesion producing the interruption, unless a tumour of sufficient size be formed in the vicinity, and even then the information is only partial. As in cases of *softening*, *induration*, or *atrophy* of portions, or of a considerable extent of the cord, the lesions now being considered produce phenomena which vary much with the region in which they are seated, with the nature and extent of the lesion, and with various concurrent or consecutive changes. When the organic lesion is seated in the lumbar region, and is only slightly developed, so as neither to compress nor destroy part of the organ, there are numbness or pain, prickings, twitchings, insensibility, and difficulty of motion of the lower extremities, or even of one lower extremity only. In proportion as the disease compresses or destroys both sides of any portion of the cord, hemi-paraplegia increases and extends, and complete paraplegia is developed. At last, after a longer or shorter time, according to the nature and progress of the lesion, paraplegia becomes more complete, there being loss of motion, sometimes of feeling also, of the lower limbs. Micturition and defæcation, at first difficult, become almost impossible. The catheter is constantly required, as well as the most active purgatives, which are often without effect, inflaming merely the bowels. The patient thus drags on a miserable existence, till at length escars form in the parts subject to pressure, and infiltration of the extremities and loose cellular tissue, and various consequent affections, chiefly suppression of the excretions and absorption of morbid matters, supervene, and terminate life by contaminating the circulation.

204. When the structural lesion is seated in the dorsal region of the cord or of its membranes, or spine itself, the above phenomena are often attended by difficult respiration, owing to impeded action of the inspiratory muscles from impaired influence of the intercostal nerves. And when the cervical portion of the cord is affected, besides the preceding lesions of function, the superior extremities, and even the voice and speech and muscles of deglutition, slightly participate in the paralytic disorder. The whole train of symptoms is often attended at first by little pain in the parts of the spine affected, unless when the lesion is cancerous. These formations are generally developed, more or less slowly, without any symptoms of vascular reaction or febrile commotion;

but contractions of, or spasms, or pains in, the limbs, and severe pains in corresponding regions of the trunk with the seat of disease, are very generally experienced during the more advanced stages.*

205. *e.* But little can be said respecting the *diagnosis* of the above lesions with any truth or precision. It has been supposed that scirrhus, or cancer, involving the cord or its membranes, will be indicated by lancinating pains occurring at intervals, especially towards the close of the disease; by a straw yellow tint of the skin; by the presence of the same disease in other parts of the body, and by the advanced age of the patient, as it seldom appears until after the meridian of life. But, although these indications are generally observed, they are not always present. Tubercles can be inferred to be the cause of the symptoms characteristic of organic lesions of the spinal cord, only when their existence in other organs or parts have been or are manifested; and when the early age of the patient, the scrofulous taint, and the absence of inflammatory symptoms further aid this inference. The syphilitic cachexia, and the existence of osseous tumours, externally may suggest the presence of similar tumours in the

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* The following cases, more or less abridged from the original reports, will illustrate the history of the lesions now considered:—

i. *Fibrous tumour in the Theca Vertebralis.*—A female, aged thirty-five, felt pain the back and side, and was very sensible of cold in her legs; the left foot and ankle soon afterwards becoming weak, cold, heavy, with impaired power of locomotion. Two months afterwards the right leg was similarly affected; these sensations, with numbness now extending up to her loins. Her gait was unsteady, but there was no tenderness along any part of the spine. Five months after the first symptoms, she had darting pains in the knees, aching in the loins, and great difficulty in walking. Sensation was impaired. She had cramps in her legs. In about twelve months, she could not stand, involuntary movements of the lower extremities occurred, and she voided urine with difficulty. Fourteen months from the commencement of disorder, sensation and motion of the lower limbs were abolished, but the urinary bladder expelled its contents. Four years from the invasion, any attempt to move caused cramps of her whole frame. She had severe pain in the back and lower part of the body. Both limbs were very cold, and the right was much swollen. Five years from the date of disorder, no sensation or motion existed below the loins, but tickling the soles of the feet produced involuntary movements. She lived upwards of seven years from the invasion of the paralysis.

On *inspection* after death, the body was much emaciated, extensive sloughing existing over the sacrum and hips. The brain was healthy. "At the lower dorsal portion of the spinal cord, there was a tumour, involving the substance of the cord, about the size of the last joint of a man's forefinger. It was of firm consistence, and osseous where it sprung from within the dura mater, opposite the eleventh dorsal vertebra, to the depth of a quarter of an inch, and fibrous, with rough granular matter intermixed in the rest of its structure. Its distinct round form compressed, and was firmly attached to the arachnoid and spinal cord itself, so as to cut into and flatten the nervous substance of the cord. For about two inches below the tumour the cord was much softened, and a little behind its centre was a canal, half an inch long, within its neurine." (Smith and Ewen, *in Reports of Pathol. Soc. of Lond.* 1847 and 1848, p. 180.)

ii. *Tubercles in the Spinal Marrow.*—A laundress, in a delicate state of health for some time previously, complained of pains in the back and lower extremities, with impaired power in her legs. After some weeks, she complained of tingling and pricking pains, and a fortnight afterwards, she had complete paraplegia, both sensation and motion being simultaneously destroyed. She now began to suffer severely from spasmodic contraction of the muscles, chiefly when about to fall asleep, or when the legs were touched or shifted in bed. The knees were then rigidly bent and drawn up to the abdomen. The introduction of the catheter into the bladder, produced the spasms. The bowels were constipated; but after the action of medicine, she could not retain the fæces. She had catching pains, with spasms in the lower ribs and hypogastrium, and pain in the lumbar region, with slight projection of one of the spinous processes. A slough formed on the sacrum; bronchitis supervened, and she died, about three months from the invasion of paralysis.

The *examination, post mortem*, displayed the membranes of the spinal cord in a healthy state; "but at two points, the upper one opposite to the eighth, and the lower to the twelfth, dorsal vertebra the spinal marrow was slightly swollen into a globular form, and felt hard; the surface, in colour, texture, and vascularity, remaining unchanged. On making a longitudinal section of the upper swelling, an oval mass of tubercular matter, three-quarters of an inch in length, and about the same diameter as the spinal marrow, of the firmness of a lymphatic gland, of uniform structure, and of a pale green hue, was seen to occupy the whole interior of the organ, and was invested all round by a thin layer of medullary matter. The structure of the spinal marrow immediately adjoining the morbid growth appeared sound. The swelling a few inches lower down was caused by a similar circumscribed mass of tubercular matter, contained in the interior of the cord, but it was smaller in size. In the left crus cerebelli, close to the pons Varollii, and about its middle, another tubercular tumour, in colour and size not unlike the kernel of a hazel-nut, was found imbedded in the substance of the crus, at the depth of a quarter of an inch from the surface, the adjacent medullary matter being quite healthy. There was also a tumour of the same structure, and of the size of a pea, in the left hippocampus minor. Tubercles were scattered through both lungs, &c." (Mr. Shaw, *in Ibid.*, 1848 and 1849, p. 24.)

iii. *Cancerous tumour in the Spinal Canal.*—A man, aged forty-six, of intemperate habits, could not sit erect without support. There was complete loss of voluntary power below the pelvis, and total anæsthesia in the right leg. He could feel pinching in the left. Reflex action was slowly produced by severe pinching, which easily excited erythema. There was tenderness over all the lower dorsal vertebræ. The paralysis afterwards invaded successively the abdominal muscles and the bladder and arms, so that for some weeks before death, loss of sensation and voluntary motion was complete below the chest. Slight reflex action of the legs could be produced by severe pinching. Convulsive attacks preceded death.

On *examination*, the body was much emaciated. "The brain and membranes were healthy. Within the spinal canal, closely adherent to the theca externally, there existed an irregular encephaloid mass, mottled with dark spots, extending from the third to the sixth dorsal vertebræ, the bodies of which were carious, and infiltrated with cancerous matter. The tumour extended outwards between the spines of the vertebræ and muscles to near the integuments. The portion of the cord beneath it was flattened, soft, and wasted. An ounce of fluid was contained beneath the arachnoid below the tumours." Cancerous matter was found also in the lungs, liver, heart, and pancreas. (Dr. C. J. B. Williams, *in Ibid.*, 1846 and 1847, p. 43.)

iv. *A fibro-carcinomatous tumour invading the Spinal Canal, &c.*—A young lady had a tumour firmly attached between the angle of the eighth rib, and the spinous processes of the vertebræ on the left side. It was hard, painless, and immovable, and of the size of a large orange. Five months afterwards, she had weakness and numbness of the legs, so that she could not stand. On the following day she was completely paraplegic; and on the day after this she passed her motions involuntarily and there was retention of urine. She afterwards had cough, rigors, profuse perspiration, shortness of breath, and quick pulse. She had a slight convulsive fit, and soon afterwards expired — four days from the appearance of paralysis.

After death, this tumour was found to be composed of carcinoma fibrosum, and was very dense. The arches of the dorsal vertebræ and the spines were next raised, and upon the visceral surface of the fourth and fifth, a growth somewhat similar to the external one, and of such a size as to contract considerably the calibre of the vertebral canal, was discovered. "This growth resembled carcinoma, although somewhat lobulated. Opposite to this, the theca was congested, although its normal contour was preserved. Upon opening the theca posteriorly, in the centre, the veins on the posterior surface of the cord were turgid, and the cord itself was a little flattened. When the anterior portion of the theca was divided in the centre, and reflected laterally, the anterior columns seemed to fall spontaneously on either side, and to expose the grey matter of the medulla, which was of a darker tint than usual, and very soft. This softening extended about an inch." The left thoracic cavity was invaded by a tumour corresponding with that in the dorsal region outside. (Mr. A. Key, *in Ibid.*, 1848 and 1849, p. 25.)

spinal canal; but of this there is rarely any evidence; a supposition only can be entertained.

206. *f.* The *prognosis* in the above states of disease is always unfavourable. No correct idea even can be formed as to the term of their duration. After the paraplegic symptoms, or spasms, which they produce, have appeared, a few days only may be the term of existence; or life may be prolonged for several years, as in the cases which I have here adduced. When the lesion is seated in the upper regions of the cord or its its membranes, the duration of the disease is generally much shorter than when it is seated in the lumbar region.

207. *g.* The *treatment* of the structural changes just considered, cannot be directed with much advantage, even if the nature of these changes were sufficiently manifest; but in most cases we proceed in the dark, although in some instances, more or less light breaks upon our path. Yet, whatever may be the particular lesion in this quarter that we may be required to combat, there is one indication which should always guide our steps, and this is to support the vital resistance to the extension of disease. There are very few organic changes which are not increased by inflammatory action, on the one hand, and by debility—by impaired constitutional power, on the other. We should, therefore, endeavour to improve the general health, by promoting the digestive, the assimilating, and the excreting functions, and by removal to a dry, pure, and temperate air; avoiding excitement, and all sources of physical and mental irritation. It may sometimes be requisite to support the strength; and for this purpose such medicines as have the effect may be given with those which are most likely to procure the absorption of morbid growths, or to arrest their progress. With these intentions, the bitter infusions may be given with small doses of the iodide of potassium and the solution of potash, or the carbonates of potash, or Brandish's alkaline solution; and to these the preparations of sarza may be added; or, as circumstances may suggest, the iodide of iron may be given in the syrup of sarza. In many cases, the chief manifestation of disease—the paralysis produced by the organic change, will either be treated empirically or removed from the care of the scientific physician; and, although certain of the means thus employed may be more or less beneficial, especially electricity, galvanism, and electro-magnetism, yet they may be injurious, in some cases, when prescribed without due discrimination. Whenever the paralytic symptoms are attended by spasms or spastic contractions, then these are hazardous means; and the same may be stated respecting nux-vomica, strychnine, and phosphorus. But it is unnecessary to add to what I have advanced above (§§ 173. *et seq.*), or to what has been adduced respecting the *treatment of* PARALYSIS.

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SPLEEN — DISEASES OF THE.

— Synon. — Σπλήν, Gr. — *Splen*; *Lien*, Lat. — *Rute*, Fr. — *Milz*, Ger. — *Milza*, Ital. — *Milt*.

1. The *diseases of the spleen* have not attached to themselves that degree of importance to which their not infrequent severity, their prevalence in malarious localities, more especially in warm climates and in armies, and the danger often attending them, most undeniably entitle them. This may be partly owing to the uncertainty hitherto existing respecting the functions of this organ in health, and of the exact nature and pathological relations of the maladies to which it is subject. The superficial manner in which disorders of the spleen have hitherto been considered is an opprobrium, with which not English medical literature merely, but the medical literature of other countries also, is justly chargeable. When it is considered, that our expeditions and armies during the last two hundred years, and in all latitudes, from Heligoland, Walcheren, &c., to Burma and China in the East, and the Monte Video in the West, — that all our colonists and settlers, from Canada to Australia, — that all our dependencies in both the Eastern and Western hemispheres, — and that all races, both fair and dark, more especially the former, have suffered more or less, and have not infrequently been carried off by diseases of the spleen, the imperfect knowledge and scanty literature of these diseases are matters of no small surprise.

2. I. Intimate Structure of the Spleen:— Before proceeding to consider the diseases of the spleen, it will be advisable to offer some remarks upon the normal structure of this organ. From the time of Winslow to that of Andral, this viscus was said to be composed of the following constituents: — 1st, A fibrous structure forming its sub-peritoneal, proper, and investing capsule or membrane, and detaching from its internal surface a number of fibrous septa and filaments, which divide and subdivide so as to form a number of cells into which the blood is effused; 2nd, Veins, which throughout their whole extent, communicate with these cells by an infinite number of perforations in their sides; 3rd, Arteries, the small branches of which ramify on the septa of the cells; 4th, Nerves and lymphatic vessels. Sir E. Home and Beclard appear to have agreed with the foregoing description, and to have viewed the spleen as strictly an erectile structure.

3. More recently the microscopical anatomists, especially of Germany, have upset this account; and Müller, Ecker, Güsburg, Gluge, Œsterlen, Hessling, Gerlach, Giesker, Arnold, Kölliker, and others, have furnished us with very different descriptions of the structure of this viscus. These, however, by no means agree; but, as Kölliker's description appears to be the most minute, and to enjoy the most credit—as it is, moreover, published in this country, and in a contemporary work, I shall endeavour to give a brief account of the results of his researches. These are, however, by no means clear, and certainly tend to throw but little light upon the diseases and lesions of the organ.

4. This author notices—1st, The *serous* or *peritoneal membrane*, which accurately covers the outer surface of the spleen, with the exception of the *hilus*, constituting the gastro-splenic ligament, and conveying the vessels to and from the viscus; this covering is intimately connected with the subjacent fibrous and proper coat of the organ.

5. 2nd, The *fibrous or proper coat* encloses the parenchyma of the spleen on every side, as a sac or envelope, with the exception of the hilus, where the two membranes diverge, and are separated by vessels, nerves, and areolar tissue. The inner surface of the coat "bounds the parenchyma of the organ, and with the exception of very numerous solid processes, which come off from it, is limited by the *trabecular tissue*. At the hilus of the spleen it sinks into the interior of the organ in the shape of tubes (*vaginæ vasorum*), which ensheath the entering and emerging vessels, and are continued on these throughout the whole parenchyma." The fibrous coat is composed of white fibrous tissue, mixed with elastic or yellow fibres; the former of these consists of bands which take a parallel course, but do not form distinct bundles; and the latter are united in a very dense and irregular network.

6. 3rd, The *trabecular tissue* consists of "white, shining, flat or cylindrical fibres, which arise in great numbers from the inner surface of the fibrous coat, and in smaller quantity from the exterior surface of the sheaths of the vessels. These are so connected with similar fibres in the interior of the spleen as to form a network which extends throughout the organ. Between the fibres of this net exist a great number of spaces, which are connected with each other, and are occupied by the red spleen substance (5th) and splenic corpuscles (4th); and which, although very irregular in respect of their form and size, have yet a considerable resemblance to each other." The trabecular tissue completely corresponds with the fibrous coat, since it consists of white and yellow fibres; and this Kölliker considers to be muscular; but, if this be admitted, the fibrous tunic should be considered as muscular also; and both being viewed as muscular, the contractions of the spleen, so often remarked upon, may be accounted for. Malpighi and others had, previously to this writer, contended for muscular fibres in the partitions of the spleen; but Kölliker appears to have been the first to demonstrate them microscopically.

7. 4th, The *splenic vesicles or Malpighian corpuscles*, are whitish spherical corpuscles imbedded in the red spleen pulp (5). They are frequently not seen in the bodies of men dead of disease, although normal structures, which are invariably present in the healthy subject. The size of these corpuscles varies from one-tenth to one-third of a line, on an average of one-sixth. They are imbedded in the red spleen substance, and, with the exception of one point, where they are attached to external twigs, they are every where surrounded by this substance. Hessling and Kölliker believe that, in the healthy spleen, they constitute from one-fifth to one-sixth of the whole splenic mass. Each Malpighian corpuscle possesses a special membrane and contents, and therefore is not a solid corpuscle, but rather vesicle; this membrane appearing to be only a modified portion of the vascular sheaths (§ 5.) with which it is continuous. The contents consist of a small quantity of a clear fluid, and a large quantity of morphous particles, which, according to J. Müller, very much resemble the corpuscles of the spleen-pulp, and have a general likeness to the blood discs, but are irregularly spherical, often resembling the chyle corpuscles. Kölliker maintains that the Malpighian bodies are closed corpuscles, and stand in no connection with the lymphatics; that they constitute a kind of shut glandular vesicle, and that there is nothing to warrant their being regarded as glandular vesicles.

8. 5th, The *red spleen substance, pulp, or parenchyma of the spleen*, is a soft reddish mass, which fills up all the interstices between the larger partitions and the stronger vessels. Having made a section of the viscus, it is easily scraped off or squeezed out. It consists essentially of three constituents, viz. fine blood-vessels, parenchyma-cells, and small portions of fibres, to which may be added, extravasated blood in various metamorphoses. The cells of the spleen pulp, or parenchyma cells, are similar to the Malpighian corpuscles, but of a darker colour, and of a more variable and smaller size. The blood effused in the spleen pulp and the blood-globules are almost constantly undergoing dissolution in the spleen and disappearing, according to the researches of Kölliker.

9. 6th, The *vessels of the spleen* enter the hilus of the spleen, and on arriving at the viscus, both arterial and venous branches receive, as a covering or sheath, a process of the tunica propria of the spleen, which forms the *vaginæ vasorum*, already noticed (§ 5.). The calibre of the splenic

vein, according to HOME, GIESKER, and others, is in proportion to that of the artery, as five or six to one; whilst the thickness of its coats is very inconsiderable, and it has no valves. The arteries, veins, and nerves are enclosed in sheaths of the tunica propria; and not only are the trunks of entering and emerging vessels thus covered, but their finer ramifications receive a similar clothing. The arterial branches ramify minutely in the Malpighian corpuscles and surrounding red pulpy substance, into which latter part especially, all the fine pencil-shaped ramifications pass; and the commencements of the veins spring from these branches. These nervous commencements or capillaries are tolerably large, anastomose frequently with each other, and scarcely have a special coat as yet. They give the cellular appearance seen in inflation of the veins of the pulp, and which, injected, form structures resembling the corpora cavernosa of the penis. The lymphatics in man are rather less numerous than in the other glandular organs.

10. 7th, The *nerves* of the spleen, proceeding from the splenic plexus, accompany the splenic artery, and divide in such wise at the giving off of its branches, that each artery receives one, or very frequently two nerves which accompany it, and here and there anastomose with each other. The nerves may be traced on the arteries which go to the Malpighian corpuscles; and by the aid of the microscope, they may be seen passing into the pulp, on the pencils of minute arteries.

11. II. THE PHYSIOLOGICAL PATHOLOGY OF THE SPLEEN rests on a knowledge of its structure; and therefore I have endeavoured to give, as succinctly as possible, the results of the researches of KÖLLIKER. HEWSON has remarked, that when an organ receives more blood than it requires for its own nutrition, we may conclude therefrom that the blood undergoes a change from it, or a secretory process takes place; and this applies strictly to the spleen. This physiologist, and subsequently TIEDEMANN and GMELIN, believed that a particular lymph is generated in the spleen, which serves to form blood-globules. But KÖLLIKER opposes this view, and contends that the interior of the spleen is quite poor in lymphatic vessels, and that the blood in the splenic veins is poor in blood-globules; and hence that it is impossible to believe in the formation of a special lymph in the organ, or a relation to the lymphatic system. He contends that no trace whatever of the formation of blood-globules can be detected, but that, at every step of his researches, indications of a dissolution or decomposition of the globules in the spleen were presented to him. He concludes, "*that the blood-globules undergo solution in the spleen, and that their colouring matter is employed in preparing the colouring matter of the bile.*"

12. The contractile power of the spleen was observed by many anatomists, and an explanation of this power has been furnished by KÖLLIKER'S discovery of muscular or contractile fibres in it, as shown above. Hence this viscus can dilate and contract itself by relaxation of its contractile or muscular fibres existing in its balks, coats, and vessel-sheaths; and hence it becomes turgescent, and by contraction of these it becomes small. During its turgescence, a stagnation, and possibly even an extravasation of blood takes place in its capillaries and pulp, the globules thus more readily undergoing solution or destruction; this change taking place in the Malpighian corpuscles, and in the parenchyma cells.

13. This theory of the function of the spleen has received the support of ECKER and BECLARD; and it serves to explain the diseased condition of the viscus, and the influence exerted by those conditions on the œconomy. That this organ is more or less affected in the course of fevers, periodic, continued and exanthematous, is well known, and especially when these maladies assume an adynamic or malignant character. That it is also often disordered or diseased in scurvy, purpura, chlorosis, rheumatism, and in some other chronic maladies, has been remarked; and it is generally admitted, that enlargements and other organic changes of the organ, if they be of considerable continuance, are attended by more or less marked anæmia and emaciation. The emaciation, anæmia, and other changes in the blood, as a superabundance of fibrine, &c., so frequently observed in the progress of periodic fevers, rheumatism, &c., may readily be referred to dissolution of the blood-globules in the spleen during the congestions and enlargements of it in the course of these maladies. J. P. FRANK has remarked respecting the spleen that, "aliorum fere morborum imperio turget et subsidet," and, in these circumstances, the changes produced by it on the blood, cannot fail of being more or less considerable.

14. III. CAUSES OF DISEASES OF THE SPLEEN. — Diseases of this viscus occur at all ages. I have seen them in infants of only a few weeks old, and in very aged persons, as well as at every intermediate age. They are very frequently met with in warm, marshy countries, previously to puberty, in both the white and dark races, but more especially in the children of Europeans born in those countries. The children of English or other European parents born in the East or West Indies, seldom escape some affection or other of the spleen, if they continue to live in malarious districts during the periods of childhood, or until the period of puberty. The male sex is more liable to them than the female, probably owing to the former being more exposed to the causes of splenic disease, and to the greater temperance, and to the periodic discharges of the latter. Of all causes, the *endemic* are the most influential, especially malaria from any of its various sources, and the use of marshy, stagnant, or impure water, or water preserved in tanks, or containing decayed vegetable or animal matters, or both (see art. ENDEMIC INFLUENCE). These causes, according to their concurrence with other causes, or to the constitution of the individual, are productive of either inflammations, congestions, enlargements, or other organic changes of the spleen, generally as a complication or as a consequence of periodic fevers; but they may produce these affections independently of antecedent or attendant periodic fever. Besides these causes, others are not without influence, namely, living in low, humid, and close situations, and in wet, clayey localities, or in cold and damp cellars; debility and vital depression, produced in any way; unwholesome or insufficient food; running, long walks and fatigue; intemperance in food or drink; and whatever contaminates or alters the constitution of the blood and chyle.

15. There are certain circumstances connected with the circulation and the state of the blood, which favours the production of splenic disease, although various local and constitutional causes aid in the result. Continued muscular efforts not merely increase the rapidity of the circulation, but also change, in some degree, the state of the blood itself, and alter more or less its normal distribution in the several organs and parts of the frame. During muscular exertion, the blood is thrown inwards in larger quantity, and distends the visceral veins and large venous trunks, the spleen becoming in some measure a diverticulum to the venous circulation in these circumstances. Somewhat similar changes occur during the cold stage of agues, and in the period of invasion of other fevers, before reaction takes place; but, instead of the circulation being greatly accelerated, and *active* congestion of, or vascular determination to, internal viscera being produced, as in the former circumstances, it is rendered slower than natural in the latter; *passive* congestion of the internal veins and viscera being occasioned by the partial suppression of the circulation in the extremities and on the surface. During the operation of any of the former category of causes, the active determination of blood to the organ may occasion the more acute forms of splenic disease, whilst during the action of either of the latter, engorgements, enlargements, and other chronic affections of the organ are more liable to result.

16. The state of the blood itself also very materially influences the nature and form of the resulting disease. As long as this fluid continues uncontaminated, or preserves its natural crasis, the splenic affection retains more or less of a sthenic character. But when the blood becomes contaminated, either by infectious emanations, or by septic or deleterious effluvia, more especially by such as proceed from the decomposition of animal matter, the spleen experiences the most serious changes, and these generally assume an asthenic or septic character, this organ being not merely congested or enlarged, but also remarkably softened, deprived of vital cohesion, and otherwise greatly altered. There is no part of the frame, which sooner or more remarkably betrays, by these changes, the consequences of vital depression and contamination of the circulation, especially in warm and malarious climates and localities, than the spleen.

17. Amongst the most common causes of disease of the spleen, especially of an acute character, are long marches in malarial countries, running, fatigue; falls, injuries, or blows on the left hypochondrium; drinking cold fluids when the body is overheated and perspiring, unwholesome beverages, and irregularities in diet. Hence the greater frequency of affections of the spleen, and the very acute form which these affections often assume, in soldiers in active service in warm climates. Diseases of a chronic kind, and very often those which are acute, are, in these circumstances, amongst the most difficult and serious maladies which come under the care of the physician; and they are not the less so, that they are seldom primary, and rarely occur in persons previously healthy, they being more frequently complications, or consecutive upon, or sequelæ of other maladies, especially of periodic fevers, of obstructions of the liver, of chlorosis and uterine obstructions, of diseases of the heart and vascular system, particularly the veins.

18. Anxieties of mind, depression of spirits from any cause, discouragements, disappointments, losses of friends or fortune, nostalgia, and whatever tends to lower the tone of the mind, or to depress mental vigour and activity, exert considerable influence both in predisposing to, and in more immediately producing, disorders of the spleen. Persons predisposed by these causes are the most liable to be attacked not only by diseases of the spleen, but even more frequently by those maladies, of which these diseases are either complications or sequelæ; and are much more susceptible of the effects of those endemic causes which are so injurious in hot climates. It is not great heat merely which is productive of diseases of the spleen and their allied maladies, but chiefly sudden falls, or rapid alternations of temperature. At the terminations of the periodic rains, and when the nights become comparatively cool or cold after hot days, the air being loaded with malaria, and the circulation determined, from the surface and extremities, upon the internal viscera, the frequent congestion of the spleen, thereby produced, or otherwise caused, as by the frequent recurrence of the cold stage of an ague, occasions either inflammatory or sub-inflammatory affections, or structural changes of this viscus,—results which the impression of malaria on the nervous system, when aided by mental depression and vicissitudes of temperature, the more certainly and severely induces. In warm climates congestions or other diseases of the spleen seldom occur in females, either primarily or consecutively of periodic fevers, without being associated with disordered menstruation — without delayed menstruation or chlorosis in young females, or suppressed menstruation or leucorrhœa in females of maturer age.

IV. Painful Affection of the Spleen. — Synon.— *Splenalgia* (σπλην, spleen; and αλγεω, I am pained). — *Dolor lateris, obstructio lienis*, Auct. Var. — *Splenis dolor*, — *Splenic pain, pain in the left side.*

Classif.— II. Class. — III. Order (*Author in Preface*).

19. Definit.—*Pain in the left side, without febrile symptoms, occurring often suddenly, and frequently ceasing as suddenly, sometimes caused by running, and occasionally being symptomatic of hysteria or uterine disorder.*

20. *A. Splenalgia* most commonly occurs in the circumstances just named, and in its slighter forms it is often complained of by boys or others upon sudden exertion, especially running up hill, or against the wind, or ascending heights; and it usually ceases soon after the causes. When it appears in hysterical females, or in connection with uterine disorder, it is much more obstinate and liable to recur. With the severity of pain referred to the left hypochondrium, there is often either shortness of breath, or a painful stitch on breathing, or frequent sighing, and the pain may be mistaken for pleurodynia, or even for pleurisy; but the absence of febrile symptoms, the circumstances in which it occurs, and its sudden or quick subsidence with the cessation of the cause, sufficiently characterise the disorder, and distinguish it from inflammatory or structural disease of the viscus. When splenalgia is occasioned by running or other

kinds of physical exertion, it may with justice be imputed to a rapid or sudden congestion of the spleen by a greater flow of blood into the organ than return of the fluid by the veins; the sudden distension or turgescence, causing stretching and pain of the fibrous structure and peritoneal envelope of the organ. When the affection is connected with hysteria, or with uterine disorder, or with indigestion, it may be imputed either to sudden congestion, or to a morbid sensibility of the nerves supplying the viscus. It may be remarked, that the term splenalgia has been improperly implied to both inflammatory and organic lesions of the spleen—as a generic term for splenic diseases — by some modern as well as earlier writers: I have restricted it as above.

21. *B.* The *treatment* of splenalgia depends upon its causes. If induced by the nature or amount of exercise, repose will generally soon remove it. If it be neuralgic, or connected with hysteria or uterine disorder, the means advised for these affections respectively will be most appropriate. Whenever this viscus betrays a disposition to disorder, by an increased or morbid sensibility, then a restorative treatment, especially by chalybeate preparations or mineral waters, appears to be indicated. But it should not be overlooked, that this affection, by persistence or recurrence, may pass into prolonged congestion or tumefaction, or into acute or subacute, or chronic inflammation, although this latter is not of very frequent occurrence. In these circumstances, the treatment hereafter to be noticed, should be adopted (§§ 62. *et seq.*).

V. CONGESTION OR SIMPLE TURGESCENCE OF THE SPLEEN.

CLASSIF.—*See Painful Affections of.*

22. *Turgescence* of the spleen is generally *characterised by more or less pain or tenderness, by a fulness or weight, in the left hypochondrium, sometimes by shortness or rather shallowness of breathing, and by various sympathetic feelings, according to its association or complication with periodic fevers or other ailments.*

23. Congestions of the spleen are most commonly met in connection with agues, with obstructions to the portal circulation, and with the other diseases incidental to warm and malarious climates, especially in children and young persons, and the offspring of Europeans in these climates. In its slighter states, congestion of this viscus is often a primary affection, and it then less frequently comes under the observation of the physician. It chiefly, when it occurs as a complication of malarious diseases, or when a frequent recurrence, or a prolonged continuance of congestion, has been followed by inflammation, or by permanent enlargement, or by other organic lesions of the viscus, that this disorder, or rather its consequences, comes under medical treatment.

24. *A.* The *symptoms* of splenic congestion vary much with the extent of congestion, with the rapidity of its occurrence, with the causes which produced it, with the temperament in which it occurs, and with the disorders of which it is a complication. If its accession be sudden or rapid, there is generally more or less pain in the splenic region; if slow, or if the affection be consequent upon ague, pain may not be much complained of. But there is generally a sense of weight or uneasiness, or fulness; and more or less pain or soreness is induced by pressure or percussion of this region, with occasionally manifest enlargement, but more commonly only an indistinct fulness of this part. There is generally no fever, unless the affection be connected with some febrile disease. When the congestion is greater or of longer continuance, the digestive, assimilating, and excreting functions are more or less disturbed. The fulness or enlargement in the left hypocondrium is greater, is often attended by tension, and the pain or tenderness produced by pressure is more felt. Various sympathetic pains are then often experienced; and the patient presents a more sickly, or a more sallow or lurid, or even a partially anæmied hue. Sometimes, also, especially when the disorder has been of some continuance, emaciation takes place, and the tongue becomes loaded or flabby, or indented at the edges. The skin generally remains cool; the pulse is low or weak, and the conjunctiva pale. The breathing is superficial or short; and the stools are very dark, whilst the urine is pale and of natural quantity. Females are generally during the continuance of congestion of the spleen subject to amenorrhœa, or to difficult and scanty menstruation, or to leucorrhœa.

25. If congestion of the spleen continue long or recur frequently, one or other of the affections about to be noticed generally supervenes, especially in hot and malarious localities, or when the disorder is connected with periodic fevers, or with obstruction to the portal circulation. Prolonged congestion, as well as other chronic diseases of the spleen commonly, is attended by, even if it actually be not influential in producing, a poor or morbid condition of the blood and impaired nutrition. The dark and sallow hue; the pallid lips, tongue, and gums; the general emaciation contrasting often remarkably with the fulness in the splenic region, and the deficient capillary circulation on the surface, impart a striking appearance to persons subject to chronic congestions and structural diseases of the spleen. Whether the changes produced in the blood by the spleen be such as tend to the full elaboration of the blood-globules — to the formations of healthy blood, — as was believed by many pathologists, and only recently denied, or whether the spleen reduces or dissolves the blood-globules, and prevents their excessive formation, as inferred by KÖLLIKER and others, there can be no doubt that diseases of the spleen induce a poor state of the blood, and more or less emaciation. If the former doctrine be entertained, the inference must necessarily be, that the splenic disease impedes the healthy or natural changes produced by the spleen on the blood. If the latter theory be adopted, it will as necessarily follow, that either the diseased spleen does not cease to reduce or dissolve the red globules, or that some other organ or organs take up the office vicariously for the spleen, and that, moreover, this office is discharged to a much greater extent during diseases of the viscus than it is even in health.

26. *B.* The *treatment* of splenic congestion consists chiefly in the removal of, or from, the causes producing the complaint, and in the cure or prevention of the diseases, of which it is consecutive. These causes are chiefly endemic, and hence change of air and locality is essential to a permanent cure of the complaint. Tonics, chalybeates, and stomachic aperients, are generally beneficial. These secretions and excretions should be sufficiently

free; but the means used to fulfil this intention ought not to be of a depressing kind. Stomachic and chologogue aperients should be conjoined with tonics, as the compound decoction of aloes with the compound mixture of iron, &c., or the compound infusion of gentian, with the infusion of rhubarb, &c.; or quinine, or preparations of cinchona may be given in various states of combination, according to the peculiarities of individual cases. In most cases, and even during residence in localities productive of congested spleen, I have found a combination of the sulphates of iron and quina, and the aloes and myrrh pill most serviceable, the last being given in sufficient quantity to act satisfactorily on the bowels. The treatment hereafter to be recommended for chronic enlargements of the spleen, may also be prescribed, in more obstinate cases, or when the disease is complicated with ague or with biliary obstruction. In the former morbid association, the decoction of bark, with serpentaria, or with the nitro-muriatic acids; or the infusion of calumba or quassia with preparations of iron, and sponging the surface of the abdomen with the nitro-muriatic acid solution, and an occasional recourse to a warm bath, followed by frictions with the horse-hair or Indian glove, will generally be most beneficial, due attention being always paid to the states of the intestinal and urinary excretions.

VI. Inflammations of the Spleen.—Synon. *Splenitis*, Auct Var.—*Lienis Inflammatio*, Sennert. — *Lienitis*, Auct. — *Cauma Splenitis*, Young. — *Empresma Splenitis*, Good. — *Splenite*, *Inflammation de la Rate*, Fr.—*Entzündung der Milz*, *Milzentzündung*, Germ.—*Acute and Chronic Splenitis*.

Classif.—III. Class.—I. Order (*Author in Preface*).

27. Defin. — *Pain, increased fulness, weight or oppression in the left hypochondrium and side of the abdomen, with febrile symptoms of a continued, remittent, or intermittent character, according as endemic causes and morbid associations may influence the œconomy.*

28. *Splenitis* is not a frequent disease, especially in an acute, and still more particularly in a sthenically acute form. Much more frequently a sub-inflammatory state, or a sub-acute, or a chronic form of inflammation exists, the last named being often long present before it comes under the notice of the physician, or not being discovered by him until its results have been fully produced, or until they have been disclosed by a post-mortem examination. The existence of acute splenitis has been even denied by some writers; but even independently of the nature of the symptoms during life, the changes found after death, sufficiently indicate an acute form of splenitis.

29. The *causes of splenitis* are those generally which have been noticed as producing indiscriminately the several affections of the spleen (§§ 14. *et seq*); but there are some which most commonly induce the inflammatory diseases of the viscus. These are chiefly exposure to low ranges of temperature after hot and sultry days in a malarious climate; the suppression of accustomed discharges, as the hæmorrhoids and the catamenia, in these circumstances, especially if the persons thus affected have lived richly, fully, or intemperately. Neglect also of turgescent or congested states of the organ may be followed by inflammatory action, those states being merely the initiatory stages of inflammation. Running, long marches, especially when followed by exposure to malaria, to the night air or dew, or by resting or sleeping on the ground; contusions, blows, or other injuries on the left hypochondrium; and previous functional disorder of the viscus, are frequent causes of the several grades of inflammation of this organ.

30. i. Acute Splenitis, *when primary or idiopathic*, is most frequently the consequence of severe injuries of the splenic region, or of the spleen itself, and of the extension of inflammatory action from an adjoining viscus, as the stomach, liver, or peritoneum, to the spleen; but it may follow any of the causes already named (§§ 14 *et seq.*).—*A.* It usually is ushered in by chills or rigors, followed by febrile action, and this by perspiration. To these are generally added nausea, depression, a sense of tension and fulness extending from the epigastrium around the left hypochondrium, and sometimes vomiting. A feeling of weight, oppression, and of tension, is soon followed by more or less acute pain, extending often to some distance around the splenic region, and sometimes to the left shoulder; this region being deeply sore, tender, and often somewhat tumid, elastic and tense. There are generally more or less thirst and loss of appetite. The urine is at first clear and highly-coloured, afterwards depositing a sediment. The fever is commonly continued or remittent, with evening exacerbations. At this stage, and with the urinary deposits, or with the occurrence of a copious perspiration, or with looseness of the bowels, or with an uterine or hæmorrhoidal discharge, the symptoms may abate, and the disease subside or disappear; or the inflammation may pass into a chronic state, the symptoms having abated more or less, but the swelling continuing, or being even increased.

31. *B.* In the *most acute* cases, occurring in the most unfavourable circumstances, as in soldiers during long marches in malarious localities, the disease often becomes greatly aggravated when advanced as far as just described, the local symptoms, as well as the general disturbance being much increased. The tongue is furred and dry; diarrhœa supervenes, with sinking of vital power, delirium, hiccup, general tumefaction of the abdomen; or, in other cases, vomiting of blood, black or bloody stools, sunk and lurid features, general agitation and distress, unconscious evacuations, &c., and death in the course of five, eight, ten, or twelve days.

32. *C.* On *examination after death*, the spleen is found increased in size. The peritoneal envelope and proper coat are of a deeper or browner red than usually seen, approaching in places to a black or deep green. They are so soft and friable as to break down easily under the pressure of the finger. The internal structure is still more softened. Some parts appear a little more dense. These present a greyish, or a yellowish grey hue, and contain points of purulent infiltration, which had begun to form, death having occurred, probably from sinking of vital power and contamination of the blood, in conjunction with the local change, before suppuration could proceed. In these cases the disease may be viewed as having gone on to gangrenous softening, or to a state very nearly approaching to this.

33. *D.* In cases less *hyper-acute*, the disease sometimes goes on to *suppuration*, and is generally

of longer duration than the preceding form; but this result of acute splenitis is not frequent, unless in the unfavourable circumstances above alluded to (§ 31.). In these, the disease having apparently reached its acme, in the course of from seven to twelve days, remits somewhat. The febrile symptoms and the pain abate, or the latter changes its character. Chills or rigors occur, terminating in flushes of heat and profuse perspiration. The swelling in the splenic region either increases or becomes more determinate or circumscribed, and the tenderness on pressure continues. The pulse is quick and soft; the symptoms varying much according to the direction the abscess may take. Generally, as the abscess advances, symptoms of partial peritonitis supervene, in the direction in which the abscess proceeds. The peritoneal envelope becomes inflamed at the part where the abscess points, and if adhesions are formed between it and an adjoining viscus, it will break into that viscus; if they be not formed, it will break into the peritoneal cavity, and general peritonitis instantly follow, and soon terminate fatally. Thus, in the course of splenic abscess, the pain in the side may become more acute, and the swelling more prominent, owing to adhesions of the external aspect of the spleen to the abdominal parietes, and to an external pointing of the abscess, which may occur in any situation between the left ribs and ilium, or between the umbilicus and left lumbar region. If the adhesion forms between the spleen and stomach, the gastric symptoms become severe, and the abscess may break into the stomach. Cases have been observed, in which splenic abscesses have thus opened into the colon, into the stomach, through the diaphragm into the pleural cavity, into the lungs, &c.

34. E. *Abscess of the spleen* is generally, but not necessarily, fatal. Some of the cases of recovery, said to have taken place, are not very conclusive; whilst in a very few instances recorded, the evidence of the existence of abscess and of recovery from it is more convincing. Acute splenitis may apparently terminate in suppuration; and the above signs of suppuration (§ 33.) may be present, and even an obscure fluctuation may be detected, and still the existence of abscess of the viscus may be disputed, or these symptoms may be even ascribed to other lesions. From this state the patient may recover; and although we may correctly infer that absorption of the pus formed in the viscus has taken place, yet the proofs of this may not be fully conclusive, although the states of the urinary, the intestinal, and the cutaneous excretions, seem to warrant the inference. When the matter is discharged externally, or even by the stomach or bowels, the patient subsequently recovering, then the fact is conclusive. Dr. Nasse, of Bonn, has recorded the history of a case of splenic abscess, in which the matter made its way from the spleen through the diaphragm into the lung, and was expectorated in great quantity, the patient afterwards recovering. As abscess of the spleen is comparatively rare, such cases must necessarily be much rarer; but there is no reason wherefore abscess in this organ should be less likely, than abscess of the liver, to be recovered from.

35. Rokitansky observes, that, in a favourable case, the abscess may be circumscribed by adhesive inflammation, and, being inclosed in a sac formed by obliterated parenchyma, which has been converted into fibrous tissue, may be borne for a long period; a partial absorption of the pus may take place, and the remainder becoming inspissated, be reduced to a calcareous, greasy pulp, or even to a hard concretion. The more common case is, that the parietes of the abscess also put on inflammatory action and suppurate, in consequence of which the abscess generally enlarges very rapidly, with symptoms of violent reaction in the shape of acute hectic fever. If the inflammation extends to the sheath of the spleen, inflammation of the splenic and adjoining peritonal surface ensues, but is not, however, apt to spread far. He adds, "that the abscess may be discharged into the abdominal cavity, and produce circumscribed peritonitis, which causes the formation of a sac, bounded by the external wall of the abdomen and the diaphragm, the fundus ventriculi, the colon and its mesentery; the entire spleen being thus occasionally destroyed by suppuration." Much more frequently, however, the discharge of the matter into the peritoneal cavity is rapidly followed by general peritonitis and death.

36. Whilst we conclude that acute splenitis may *terminate*—1st, In resolution or recovery; 2nd, In chronic splenitis and various organic changes of the viscus; 3rd, In gangrenous softening or destruction of the organ; 4th, In suppuration or abscess—it may be still further inferred, that splenic abscess may be recovered from—1st, by absorption and diminution of the puriform matter; 2nd, by pointing externally or into some viscus, by which it may be discharged from the frame; but that it much more frequently terminates fatally, by the vital and local changes it occasions, and the contamination of the circulating fluids it produces, or by the consecutive changes it causes in adjoining organs or parts, into which it may proceed or break, as the peritoneum, stomach, &c.

37. F. *Asthenic acute, or consecutive splenitis.*—Acute splenitis is much more frequently a *consecutive* than a primary disease — *consecutive of*, or *complicated with*, adynamic fevers, but more especially, and more frequently and severely with the the jungle, or remittent, or continued fevers of warm or malarious climates. In these circumstances and associations, the severity or malignancy of the fever often masks the splenic complication. The affection of the spleen, if it may be called inflammatory, is of a most *asthenic* and disorganising kind; it implicates all the tissues of the organ, but attacks chiefly its internal structures, and proceeds in a very few days, often in three or four, to produce not only great turgescence, but a complete softening, often amounting to a liquefaction of the viscus. This form of disease is a frequent complication of the periodic fevers — intermittent and remittent — and of the continued fevers of the swampy or jungle districts of the East, and of Africa; and is often also observed in the course of these fevers in the countries bounding the Mediterranean. The *symptoms* of this form of splenitis are not severe, although the changes are most rapid and disorganising, — results which are chiefly to be ascribed to the primary fever, of which the splenitis is a dangerous complication. The ex-

tremely lurid state of the countenance and general surface, the vital depression, the swelling and tenderness in the splenic region, the decubitus on the back or right side, are amongst the earliest and chief signs, those which follow, especially the dry, dark tongue, the vomiting, often with discharges of blood, hiccup, delirium, rapid and weak pulse, &c., being ascribable as much to the primary fever as to this complication, but truly to both. The rapidly disorganising course of this form of splenitis is caused chiefly by the marked depression of vital power, and the condition of the circulating fluids, the spleen being one of the most early parts of the œconomy to experience the effects of vital depression and of vascular contamination, the existence of these states both aggravating and accelerating the unfavourable result.

38. ii. Chronic Splenitis is much more frequently observed than the acute.—*A*. It may occur *primarily*, or *consecutively* of the *acute* or *sub-acute;* for, between the most acute and most chronic or mild, there may exist, as in other inflammatory diseases, every grade of severity or duration. Chronic splenitis frequently does not come before the physician until it has given rise to changes, which, although no longer entitled to the appellation of splenitis, are generally the results of inflammatory action or irritation. In malarious countries, chronic splenitis is most commonly a complication of agues, or a consequence of intermittents and remittents. In these circumstances, the initiatory inflammatory action is often masked by the primary disease. When the chronic affection is consequent upon an acute attack, the passage of the latter into the former is often gradual or insensible.

39. Chronic splenitis, whether primary or consequent upon periodic fever, or dysentery, or hepatitis, &c., may, by muscular exertion, by prolonged or quick marches, by mental excitement, or by injury, or even by a too rough examination of the splenic region, be aggravated to such a pitch as to assume a truly acute or a subacute form. But in many complicated cases, in which the patient has died subsequently to attacks of these diseases, especially in miasmatous districts, chronic splenitis has not been detected, or has been merely suspected, until a post-mortem inspection has shown purulent formations in the substance of the viscus, cartilaginous or ossific deposits in its fibrous coat, false membranes, or adhesions between the peritoneal envelope and adjoining viscera, and other changes sufficiently indicative of inflammatory action, which, however, had either not been manifested during life, or had been overlooked, especially when masked by the primary disease.

40. *B*. The *symptoms* of chronic splenitis are, however, in some cases, more distinctly evinced. The pain, weight and uneasiness in the left hypochondrium are more felt, especially after exertion, and in soldiers after marches. There is generally a remittent or intermittent form of fever, either connected with ague, especially its more irregular types, or simulating this complaint, the exacerbations being most remarkable in the evening or night; the skin being dry, and the pulse frequent, whilst the countenance is sallow, and the skin harsh. As the disease proceeds, the already existing swelling of the splenic region, or even of the whole abdomen increases, or becomes more tense, whilst the extremities and other parts are more or less emaciated. There are always indigestion, disturbed dreams, and obtuse pain or uneasiness in the left side, which is increased when turning in bed, or on pressure. In some cases, a dry cough supervenes, with frequent and superficial respiration, and in others palpitation; and, in the more prolonged or neglected, or improperly treated cases, ascites is superadded. After an indefinite time, either recovery takes place slowly, owing to change of climate and regimen, or death occurs from sinking of the vital powers in connection with changes in this viscus and adjoining parts, especially purulent collections and alteration of the circulating fluids.

41. As in acute, so in chronic splenitis, the variation in the severity and character of the symptoms is very great. The duration also of the latter form varies remarkably. In the course of it various complications not infrequently appear, chiefly owing to the altered state of the circulating fluid, in some cases, doubtless, produced by the absorption of matter from the spleen, or from the extension of functional or structural disease from this viscus to adjoining organs. In many cases, as the disease advances, debility and emaciation become extreme; and hectic fever, sometimes slight, in other instances severe, is generally present. Vomiting or diarrhœa often occurs, and is generally obstinate or attended by discharges of blood either upwards or downwards. Aching of the back and limbs, restlessness, anxiety, weight, soreness, oppression and tenderness in the splenic region, are severally more or less experienced.

42. When considerable enlargement of the viscus attends chronic splenitis, dry suffocative cough, dyspnœa, hiccup, palpitations, &c., are often complained of; and, in some instances, if the inflammation have extended to the surface of the upper portion of the viscus, the peritoneal lining of the diaphragm becomes implicated, and lymph with adhesions is sometimes formed, these symptoms being much aggravated and occasionally accompanied with several of those which I have shown to characterise *diaphragmitis* (see art. Diaphragm, §§ 2. *et seq.*). In other instances, the disease superinduces effusion of fluid in the peritoneal cavity, an occurrence often observed when chronic splenitis follows, or is associated with obstruction to the portal circulation through the liver, or structural disease of this viscus. Less frequently the disease extends to the left kidney; and, in this case, nephritis supervenes, with more or less disturbance of the urinary functions, and aggravation of the febrile symptoms, generally terminating in delirium, coma and death. In rare instances, phlebitis in some limb or organ takes place, and soon carries off the patient.

43. The variations in the severity, the symptoms, associations, as well as the *duration* of chronic splenitis, are very great. If the disease accompany ague, it may be so slight at first as to escape attention; but it generally becomes more severe and manifest with the recurrence of the aguish paroxysms. If neglected at first, it often becomes a painful, a prolonged, and even a formidable disease, generally continuing several months, and not infrequently lasting for some years, with periods of remission.

44. *C.* The *terminations*, or rather the results of sub-acute and chronic splenitis are — 1st, resolution, which seldom occurs; 2nd, aggravation of the inflammatory action to a sub acute, or even an acute form; 3rd, suppuration and abscess in the forms already noticed; 4th, softening, induration, ossific deposits, &c.; 5th, enlargement, with various associated changes. Although *gangrene* sometimes follows the hyper-acute, or the asthenically or complicated acute form of the disease, it very rarely or never follows the chronic, unless this latter have become suddenly or severely aggravated by exertion, as by long or quick marches in military service, or by external injuries. These consequences or terminations are also common to the acute form, for this rapidly passes into a sub-acute or chronic state, unless when it is complicated with malignant or adynamic fever, and terminates in fatal disorganization or gangrene.

45. Dr. VOIGHT states, that *splenalgia* (synonymous, according to him, with inflammatory affections of the spleen) rarely goes on to suppuration in Bengal; but, when not fatal, it generally terminates in induration, if not cured in time. The febrile symptoms then disappear, and pain in the left hypochondrium is much diminished, but the tumour remains and becomes hard and distinct. The health improves, and, with the exception of costiveness, a sensation of fulness and weight under the left false ribs, a dry cough, some dyspnœa, and occasionally a slight pain shooting to the scapula, the patient feels pretty well, and may live on for many years in that condition. He is, however, generally predisposed by it to fever, liver complaints, dysentery, dropsy and cholera, and by some one or other of these he is at last carried off.

46. In its more severe states, especially when complicated, splenitis runs its course very rapidly, and it may terminate in death in three weeks or a month. Œdema of the feet and legs, ascites, dysentery, ecchymoses, severe affections of the stomach, singultus, are the general precursors of death in sub-acute cases, whilst diarrhœa and hectic close the scene in the more chronic form. Persons who have once had disease of the spleen are very liable to be attacked by it again.

47. *D.* In *children*, chronic splenitis is not an infrequent disease even in this country, at least according to my experience, during the many years of my being physician to the Infirmary for the Diseases of Children; but it is much more frequent in warm climates, especially among the children of European parents. In them it generally commences with anorexia, restlessness or fretfulness, and often sleeplessness. They gradually lose all desire of play, and become indifferent to surrounding objects. These precursory symptoms may continue some days, or even as long as a fortnight, when the colour of health is more or less lost, and degenerates into a pallid, sallow, or even a leaden hue, and the conjunctiva assumes a pale blueish tint. The skin, especially over the abdomen, is dry and hot, and a greater degree of debility is experienced than the severity or duration of the complaint appears to warrant. The pulse is frequent, especially in the evening, and a remittent or hectic form of fever is commonly present; general uneasiness, headache, slight difficulty of respiration, and occasionally palpitation, and pain in the left shoulder, are also complained of. There is a constant feeling of tenderness and of weight in the left hypochondrium, increased by pressure. When the patient lies on his back, and the fingers are pressed under the false ribs of the left side, a hard tumour is felt, the size being generally less than that usually termed enlarged spleen, or even that called congested spleen. The patient dislikes the erect posture, and lies chiefly on the left side with the knees drawn up, and the trunk curved. The bowels are irregular, generally costive, the evacuations being very dark, greenish, or greenish black. The urine is usually pale and copious. After an indeterminate time, either recovery takes place, or more severe or more complicated disease, and more marked sinking of vital power supervene and terminate existence. In some cases, the emaciation becomes remarkable before dissolution, and in these, as well as in others, ascites has often existed for a considerable time previously to death.

48. iii. DIAGNOSIS OF SPLENITIS.—Inflammation of the spleen may be either overlooked, or be mistaken for some other disorder, especially for peritonitis, pleurisy, nephritis, or even for tumours, enlargements, &c., of the kidney.—*a.* When the symptoms of splenitis are mild, and when the disease appears in the course of remittent, intermittent, or continued fever, then it is often difficult to ascertain the existence of the local affection, and it very frequently is overlooked or undetected, until it has advanced to serious organic change. In all periodic fevers, and more especially in persons who have experienced more than one attack of these fevers, and still more particularly in warm, humid, and malarial localities, a very careful examination should be instituted, in order to determine the existence of splenitis or other affections of this organ.

49. *b.* The diagnostic symptoms vary much with the nature of the affection, and with the part of the organ chiefly attacked. When the upper part is inflamed or engorged it may then press upon the diaphragm, occasioning dyspnœa, oppression in that situation, and even pain, which may be mistaken for pleurodynia or pleurisy. If the diaphragm be pushed upwards by the enlarged spleen, the absence of the respiratory murmur, and the dulness on percussion at the base of the left thoracic cavity may suggest the existence of pleuritic effusion. But the absence of aigophony and the extension of the dulness below the margins of the ribs, and the persistence of dulness on percussion in different positions of the body, will indicate the nature of the disease.

50. *c.* The character of the pulse, and of the pain, will generally distinguish splenitis from *peritonitis*; but when the peritonitis is limited to a portion of the peritoneum in the vicinity of the spleen, and the symptoms are not very acute, it is very difficult to distinguish it from splenitis. The peculiarities of the case, the causes of the complaint, &c., will often aid the diagnosis. In *nephritis*, the history and antecedents of the disease, the state of the urine, and the symptoms characterising it, sufficiently distinguish it from affections of the spleen. The same remarks apply to *psoitis*, which can hardly be confounded with splenitis. There is a much greater probability of *tumours* of the omentum, especially when they appear near the situation of

the spleen, being mistaken for chronic inflammation or enlargement of this organ.

51. *d.* Simple *turgescence*, or various grades of *congestion* and *enlargement of the spleen*, may occasion, owing to the stretching or distension of the peritoneal envelope and fibrous coat of the viscus, more or less pain, and may thus be viewed as inflammation of the viscus, and suggest a practice not always the most appropriate to the state of the case. The circumstances and history of the case, especially the state of the pulse and the presence of febrile symptoms, will generally evince the nature of the disease; but it should not be overlooked that the effect of the distension or swelling of the organ upon its envelopes may be such as will often pass into inflammation, if not arrested by judicious means. *Splenalgia* (§ 19.), whether produced by sudden turgescence of the viscus or hysteria, or neuralgia, or uterine disorder, may be similiarly misunderstood, if the causes and alliances of the disorder be not attentively considered.

52. *e.* The diagnosis of *suppuration* or abscess of the spleen is very often difficult, the indications of this change being generally obscure. The antecedent disorder, an irregular recurrence of chills or rigors, the continuance of the febrile symptoms, the softness of the pulse, and the occurrence of sweats of unusual abundance, on frequent occasions, are indications of suppuration, but not actual proofs of its existence. When, however, there is also swelling or tumour in the splenic region, with pain or throbbing, and marked disorder of the stomach, the probability of abscess is greater than when the foregoing symptoms are not attended by any increase of the size of the organ.

53. *f.* The *complications* of affections of the spleen may either render more difficult, or may facilitate, the diagnosis of these affections. Antecedent periodic fevers often indicate the spleen as the organ affected, when other signs of splenic disorder are present; but much more frequently the complications mask this disorder, and render the diagnosis more difficult, especially affections of the stomach, enlargements of the liver, diseases of the heart, pleurisy and pleuritic effusions, peritonitis, partial or general, and dropsical effusions into the peritoneal cavity. When chronic obstructions of the liver, or congestions, or even inaction of this organ, are evinced, or when organic disease of the heart is present, changes in the spleen are very frequently also present, although they may not be manifested during life.

54. iv. The Prognosis of splenitis and other diseases of the spleen depend much upon their severity, their nature, their causes, and their complications. When the affection is simple congestion, and is consequent upon intermittent fevers, the result is much more likely to be favourable than when it appears under other circumstances, or is produced by, or occurs in the course of remittent fever of a low adynamic or putro-adynamic character. When the symptoms indicating splenic disease are obscure, of long continuance, and not amenable to treatment, the risk is much greater than when they are more acute and more deserving of reliance. When the most acute states of splenitis occur, especially when it is detected in the course of adynamic or malignant, remittent or other fevers, the danger should be considered as great; but the degree of danger or the hopes of recovery should depend very much upon the constitutional symptoms, and the states of vital power and of the circulating fluids. The effects of treatment, also, when this is rational and appropriate, ought not to be left out of view.

55. Even when the disease is sub-acute or chronic, our opinion of the result ought to depend much upon the history of the case, upon its origin, upon the state of constitutional power, upon the morbid associations it presents, and upon the evidence of the existence or non-existence of suppuration, or of the extension of disease to the peritoneum or adjoining organs. The signs of suppuration are always unfavourable, although recovery occurs in a few cases where this change has undoubtedly taken place. All the complications of diseased spleen are dangerous, especially pleuritic or peritonitic inflammations, or effusions, organic disease of the heart, obstructions, enlargements, or other structural lesions of the liver, disease of the stomach or bowels, and scurvy. Vomiting of blood, or the presence of blood in the stools, has been supposed by some to be a favourable crisis of splenic inflammations or enlargements. This may be the case in a few instances, but not in others. The occurrence of the catamenia in abundance at the natural period, and of the hæmorrhoidal discharge, is much more favourable than hæmorrhagic discharges from the digestive canal.

56. The prognosis in all diseases of the spleen should be guided also by the severity of the local symptoms, in connection with the constitutional powers of the patient—by the state of emaciation, by the presence or absence of anæmia, by the manner in which the digestive and depurating functions are performed, by the extent of swelling and tenderness in the region of the spleen, by the duration of the complaint, and by the persistence or the removal of the causes, occasional or endemic, from which the disorder arose. As long as the patient continues to remain in the locality concerned in producing splenic disease, either a cure will be rendered difficult or abortive, or the disease will return with the season and circumstances which had previously produced it, with equal or even greater severity, and will either become more complicated, or terminate most unfavourably.

57. The *children* of European parents, residing in warm and malarious climates, affected with chronic splenitis, or other affections of this viscus, seldom recover completely or permanently, unless change of climate or locality be obtained for them. An amendment often takes place during the healthy season; but the complaint generally returns with or after the rainy season, either with increased severity, or in some one of the several complicated forms, in which affections of the spleen present themselves in those climates, death generally, although at some remote period, taking place, often preceded by dropsy or great disorder of the digestive canal.

58. v. Treatment of Splenitis.—*A. The treatment of acute splenitis* has been very rationally stated by Van Swieten and Sauvages; but at the end of the last century and the commencement of this, the indiscriminate and often improper use of calomel, and of calomel conjoined with opium, superseded a more appropriate practice, especially

in India, and was more frequently prejudicial than beneficial. More recently, the means usually employed have been both more rational and more salutary, although more discrimination in the employment of remedies against this disease, than is usually evinced, is still required. Calomel, or calomel and opium, general and local bleeding, &c., are still too generally prescribed, although, in some cases, either or even all of these may be required. The treatment mainly depends upon the stage or progress of the disease, upon the degree of either sthenic or asthenic action evinced by the local and constitutional symptoms, upon the type or character of the primary or of the symptomatic fever, and upon the air in which the patient resides. These should be severally weighed in connection with the age and constitution, and previous disorders of the patient.

59. *a.* If the attack be recent, acute, more or less sthenic, and the disease be primary, and the symptomatic fever continued, a general bloodletting may be prescribed according to the strength and age of the patient; and this will be the more required if the disease have been occasioned by injuries or causes directly affecting the spleen. In these circumstances, also, calomel, or calomel and opium, followed by a brisk cathartic, will be of service. A second general bloodletting will seldom be required, but local depletions may be necessary. In this form of disease, active purging, and diaphoretics in the intervals, are generally useful. Subsequently the tepid bath, frictions of the surface, and the application of a terebinthinate embrocation, or liniment, as advised in several parts of this work (see APPENDIX, For. 311.), or a blister over the splenic region, will be of advantage. After the acute symptoms are removed, the persistence of disease in a sub-acute, chronic or mild form, or enlargement of the viscus, will require a repetition of these external means, and a recourse to stomachic and chologogue purgatives, or to such other means advised for these states of the disease, as the circumstances of the case will suggest.

60. *b.* If acute splenitis be consecutive of adynamic, remittent or malignant, or typhoid fever; if it present asthenic characters, even when primary; if the attendant fever be periodic, the pulse quick, weak or soft; if the vital power be very much depressed, although vascular action be excited or the stomach irritable; if the disease has been of some duration, and has arisen from malaria, and its usual consequences; if it have been accompanied with diarrhœa, or by hæmorrhagic discharges; and if the patient still continue, or is likely to remain, under the influence of the air instrumental in causing the attack, bleeding and other lowering means should not be resorted to. A very opposite treatment is required in these circumstances, and should be prescribed promptly and with decision. In these, the sulphate of quinine, the sulphate of iron, camphor, &c., should be conjoined with aloes, a very small quantity of this last acting freely on the bowels when combined with sulphate of quinine. In some cases, it may be necessary to apply some leeches to the left side, and to give a full dose of calomel and camphor at the commencement, and a stomachic purgative in a few hours afterwards, especially if the evacuations betray biliary obstruction or disorder. But, immediately or soon after their action on the bowels, a dose of the following pills ought to be taken; and the embrocation applied over the splenic region, or over the epigastrium, by means of flannel or spongio-piline moistened with it, especially if the stomach be irritable; and this application should be renewed according to the state of the case, and the effects produced by it.

No. 339. ℞. Quinæ Sulphatis, ℈j.; Ferri Sulphatis, gr. xxv; Camphoræ, ℈j.; Extr. Aloes purif. (vel Pil. Aloes cum Myrrhâ) ʒss ad ℈ij; Pulv. Capsici, gr. x.; Extracti Taraxaci, ʒj.; Olei Cajuputi (vel Juniperi), q. s. *m.* Contunde bene et divide Massam in Pilulas xxxvj. Capiat æger duas, bis terve in die.

No. 340. ℞. Linimenti Terebinthinæ, ℥ij.; Linimenti Camphoræ comp. ʒjss.; Olei Olivæ, ʒss.; Olei Cajuputi, ʒj. *m.* Fiat embrocatio more dicto utenda.

61. The ingredients in these may be varied in quantity, according to the effects produced by them, or others may be added or substituted. If sthenic action or febrile symptoms still continue, the sulphate of iron may be omitted; and if the bowels be already sufficiently acted upon, or if diarrhœa be present, opium may be substituted for the aloes, especially if pain be severe; and the vinum or extractum opii may be added to the embrocation. The warm or tepid bath; diaphoretics, frictions of the surface, and a farinaceous or emollient diet, and gentle aperients, will materially aid these remedies, and remove the disease altogether, or reduce it to a sub-acute or chronic, or mild state. In climates where the patients continue subjected more or less to malaria; in persons addicted to intemperance in eating and drinking, or to the abuse of stimulants or alcoholic liquors; in those who have been subject to periodic fever, or to hepatic or dysenteric affections, acute splenitis often degenerates into the milder forms, or into some one or other of the organic diseases about to be noticed.

62. B. If *the sub-acute or chronic form of splenitis* be primary, if it be not a sequela of the acute, or if it do not appear in the course of intermittent or remittent fever, the treatment should depend much upon the severity of the initiatory symptoms. If these be severe, and the pulse excited, local depletion, and a brisk cathartic, will be of service; and if calomel be prescribed at the onset, or suggested by the appearance of the evacuations, it ought to be conjoined with a cathartic extract. I have seen in these cases, as well as in the most acute, a full dose of spirits of turpentine, with an equal quantity of castor oil, taken on the surface of cold coffee, or of milk, or of some aromatic water, and followed by the above medicines (§§ 58—61.), soon arrest the disease, especially when prescribed at an early period. At the commencement of these forms of splenitis, as well as in the acute, the enlargement of the viscus is generally not great, even although the pain may be considerable; but, as the disease continues, and as the more acute symptoms subside, the swelling increases, and the propriety of having recourse to those medicines which support vital resistance, and arrest the progress of the malady, becomes more manifest.

63. When sub-acute or chronic splenitis follows the acute, or occurs in the progress of periodic fevers, then a decided recourse may be had to the sulphate of quinine, combined as above (§ 60.),

never omitting the sulphate of iron, when febrile or inflammatory action is not present; or the infusion or tincture of calumba may be given with the ammonio-chloride of iron, or with the ammonio-citrate of iron, or with the citrate of iron and quinine. Previously to the introduction of quinine into practice, I had employed the decoction of cinchona with ammonia and camphor, and the compound tincture of cinchona, with advantage.

64. In *the consecutive states* of chronic splenitis, the administration of these medicines should not prevent an active recourse to purgatives or cathartics, but these should generally be conjoined with bitters, stomachics or tonics; and the external means, especially the embrocations and liniments already noticed, should not be overlooked. As the disease becomes more decidedly chronic or indolent, the enlargement often increases, and if these means have been duly employed without a satisfactory result, then those about to be recommended for chronic congestion and enlargement of the organ (§ 100. *et seq.*) should be employed, especially the iodide of iron in the syrup of sarza, and the sulphate of quinine and aloes in doses which will act freely on the bowels.

65. *C.* When acute, or sub-acute, or chronic splenitis is followed by symptoms of *suppuration*, or when more precise indications of abscess of the viscus exist, then the indication already stated, viz. to support the vital powers and resistance, should be steadily adhered to, whilst the secretions and excretions ought to be promoted. Various means may be additionally employed, according to the direction which the abscess may take. The most hopeful terminations of this state of disease is to procure the external pointing of the matter, or the absorption of it. The former of these may be attempted by means of poultices, or the insertion of a seton or issue, whilst the powers of the constitution are supported by the means already advised, aided by change of air, and a suitable diet and regimen. The latter, or absorption of the matter, if the internal or constitutional means be not judicious and energetic, may be followed by phlebitis, or by consecutive suppuration or abscess in other parts; but, to obtain absorption when, and as we could wish, is rarely in our power. This end can be attained only by preserving and promoting the digestive and assimilating processes, by promoting the excreting functions, by preserving the bowels in a freely open state, by conjoining vegetable tonics with chalybeates, and by removing the patient to a dry and pure air.

66 *D.* The *complications* of both acute and chronic splenitis should receive due attention.—*a.* If the early stage of the acute or sub-acute disease be primary, and appear to extend to the peritoneal surface of the diaphragm, or pleura, or to the fundus of the stomach, or to adjoining parts of the peritoneum, or to the left kidney, the initiatory bleeding already advised is generally required, and should be in such quantity, or be followed by such an amount of local depletion, as the circumstances of the case will warrant; and calomel, or calomel and opium, in one or two full doses, may also be given. But these should be followed by a cathartic, and preferably by the terebinthinate draught prescribed above (§ 62.), which may be repeated according as it may be required, and by blisters, or the terebinthinate embrocation. Vascular depletion is rarely beneficial in other states of complication, and is generally prejudicial, when the splenic disease appears consecutively, or as a complication of other maladies, especially when it is associated with dysentery, adynamic or remittent fevers, with obstructions to the portal circulation, scurvy, or disease of the heart.

67. *b.* When the *stomach* is prominently affected, and indeed in the other associations of the disease, whether *gastric*, *intestinal*, or *hæmorrhagic*, the terebinthinate embrocations or liniments already prescribed will prove serviceable, if duly persisted in — if applied over the epigastrium, the splenic region, or abdomen, and renewed, as circumstances may suggest. If chronic *diarrhœa* be associated with chronic splenitis, ipecacuanha may be given in the form of pill with the sulphate of iron, quinine, and the extract of hops. If the splenic disease be complicated with *disease of the heart*, our chief reliance should be placed on the sulphate or other preparations of iron, conjoined with the medicines just mentioned, or with henbane, conium, opium, &c., according to the peculiarities of individual cases.

68. *c.* The association of chronic splenitis or its consequences with biliary obstruction, or *hepatic disease*, is very frequent in warm and malarious climates, and is especially obstinate, the splenic affection generally going on to chronic enlargement. In this frequent complication, a weak dilution of the nitro-muriatic acids should be administered both internally and externally — internally with light bitter infusions, as the calumba or cheireita, and the preparations of taraxacum; and externally in foot baths, or as tepid lotions or epithems over the hypochondria and abdomen. The preparations of iron should not be given in this complication. If *jaundice* be superadded, or dropsical effusion into the peritoneal cavity, the supertartrate of potash may be prescribed in large doses, sometimes with small or moderate doses of the potassio-tartrate of iron, and always with extract of taraxacum, in the form of an electuary with any suitable syrup or confection; or the acids already named may be given in the compound decoction of scoparium. Whenever the liver is implicated, the preparations of iron are generally prejudicial, the potassio-tartrate being the only one admissible, and only in small doses. If the associated diseases of the spleen and liver be characterised by enlargement, or if these diseases be very chronic and indolent, the iodide of potassium may be employed, if these acids have failed, and may be conjoined with the solution or sub-carbonate of potash, and the decoction of taraxacum, or the compound decoction of scoparium. In cases such as these, the bowels should be kept freely open, and the constitutional powers duly supported.

69. *d.* For all *hæmorrhages* from the stomach or bowels, in the course of chronic splenitis, the spirits of turpentine, given by the mouth, or even administered in enemata, will be found the most efficacious in arresting the hæmorrhage, when the arrest is indicated as it is most frequently in splenic affections, or when it proceeds beyond what may prove salutary, or when it occurs in delicate, exhausted, or anæmied persons. This medicine may be prescribed, as in the following

formula, the dose being increased or repeated according to the urgency of the attack.

No. 341. ℞. Olei Terebinthinæ, ʒiss.; tere cum Pulv. Rad. Glycyrrh. ℥jss. dein adde, Mellis et Syrupi Rosæ Gallicæ, āā, ℥jss. et misce. Capiat æger ʒss. pro re nata.

70. When the consequences of splenitis, especially enlargement or chronic congestion of the spleen, are connected with *amenorrhœa*, or with uterine disorder, the compound iron mixture, conjoined with the compound decoction of aloes is most serviceable.

71. In all forms and complications of chronic splenitis, change of air is extremely beneficial, and the benefit is further promoted when this change is conjoined with a regulated diet and a proper recourse to chalybeate or sulphureous mineral springs, or to artificial waters.

72. E. *The treatment advised by writers* on inflammation of the spleen has been stated more empirically than with due reference to the forms and stages of the disease. The early and acute stage is said, by a recent writer, to require "general bloodletting as long as the inflammatory pain is considerable, provided the patient's strength will admit of it. A moderate degree of catharsis should be kept up. A plentiful application of leeches to the seat of pain, followed by vesication, will sometimes complete the cure; but the disease is apt to remain latent: it may subside apparently, and then reappear with a violence sooner or later fatal." (*Cyclop. of Pract. Med.* vol. iv. p. 58.) As I have contended above (§ 60.), the most acute splenitis, if it present asthenic characters, will not, however prompt or energetic the depletion may be, admit of this treatment; and even the most sthenic form of the disease requires the more cautious recourse to depletion, which I have recommended, especially when the disease proceeds from endemic causes. It should be recollected, that the causes are generally of a depressing nature, and if these still continue in action, too free depletion renders the disease more serious, and its consequences more difficult to remove. The re-appearance of the complaint with fatal violence, here said to occur contingently, is frequently owing to the neglect of the tonic remedies which I have advised after the acute symptoms are subdued, especially when splenitis is consequent on periodic fevers, or is otherwise complicated, or when the patient remains in a malarious locality. When, however, the disease is associated with peritonitis or with pleuritis, &c., vascular depletion, general or local, as I have recommended, should not be neglected, with due reference, however, to the peculiarities of the case.

73. **Sauvages** insisted on the propriety of having recourse to tonics and to chalybeate preparations, in connexion with aperients and sedatives, as soon as the more acute symptoms were subdued. Dr. **Bree** advised active catharsis, and conium and other sedatives, to remove irritation. He endeavoured to subdue inflammatory action by bloodletting, antimonials and local depletions. **Grottanelli**, who lived in a country where diseases of the spleen are endemic, advised for simple acute splenitis, and for splenitis complicated with gastritis or peritonitis, or diaphragmitis, or nephritis, or psoitis, hepatitis or peripneumonia, general bloodletting, to be repeated if the circumstances of the case required it, or local bleeding in the nearest situation to the part most affected. As the disease subsided to a chronic state, he recommended those remedies which act chiefly by promoting absorption, and by acting on the kidneys, and which are both antiphlogistic and diluent, as nitre, supertartrate of potash, antimonials, digitalis, &c. If the attack followed suppression of the catamenia or of hæmorrhoids, he prescribed the application of leeches upon the recurrence of painful or severe symptoms, and as soon as all signs of hypersthenia had disappeared, the gradual use of tonics to be followed by chalybeates, especially the ammoniate of iron.

74. Inflammations, as well as other diseases of the spleen, must be treated in great measure with reference to the endemic influences which are chiefly concerned in producing them. In the miasmal districts of Western Africa, and in many countries in the East, these diseases very frequently either are not benefited, or are aggravated by general and sometimes even by local bloodletting, especially in the dark races. In most acute cases, however, local depletions, when duly regulated, are of use. But, in temperate countries, either the one or the other form of depletion, or even both, are more generally required. In those more unfavourable and depressing localities, where greater caution in the use of antiphlogistic means is requisite, and the more acute symptoms rapidly pass into asthenic engorgement and enlargement of the organ, what have recent writers advised? Before the introduction of quinine into practice, I had occasion to treat cases, in these unfavourable circumstances, and I had recourse, early in the disease, to the decoction of cinchona with camphor, aided by purgatives, and epithems externally, as advised above (§ 60. *et seq.*). Subsequently a much earlier and a much more decided use of quinine, in the course of splenitis, than hitherto advised, was recommended by **Nelet**, **Cruveilhier**, **Bailly**, **Piorry**, **Dalmas**, and others, especially when the disease proceeds from malaria, or is associated with periodic fever; and, even in the early and acute stage, a much more cautious and sparing recourse to vascular depletions and other antiphlogistics, than previously advised, was found advantageous in these circumstances. In most cases, however, purgatives are most serviceable, especially when duly selected, and conjoined with quinine or cinchona, or with preparations of iron, as I have already pointed out (see § 59. *et seq.*).

75. VII. ORGANIC LESIONS OF THE SPLEEN.—*Structural Changes consequent on Functional and Inflammatory Diseases of the Viscus, and on Periodic Fevers, or other Disorders.*

CLASSIF. — IV. CLASS, I. ORDER (*Author*).

76. M. **Andral** considered that the structural alterations to which this organ is liable should be sought for in one of its two component parts—the part contained, which is blood, and the part containing, which is fibrous tissue. Those affecting the latter, or which are seated in the capsule or its fibrous prolongations, the trabecular tissue and muscular fibres of **Kölliker**, and in the pulp or parenchyma of the viscus, and in the splenic cells, he thinks, are of comparatively rare occurrence; those of the former, or which are found in the matter contained in those cells, are more important, inasmuch as they are variously modified, and, be

conceives, intimately connected with the origin and nature of a number of morbid productions. The matter contained in the cells consists of blood and fibrine or lymph. This latter substance was first observed by HEWSON, and has been recently viewed by KÖLLIKER, as the fibrinous remains of the blood-globules after dissolution in the intimate structure of the spleen. The importance of this substance in the animal œconomy was insisted on by TIEDEMANN and GMELIN. M. ANDRAL has made no reference to the observations of these physiologists; but, to the morbid states of this coagulated matter contained in the spleen, he has chiefly ascribed, not only a number of the changes which this organ exhibits, but many also which are found in the other parts of the body. Professors TIEDEMANN and GMELIN had attributed important offices to this matter, conceiving that it was influential, when carried into the chyle by the absorbents, or into the circulation, in changing the chyle into blood; and they had recourse to pathological facts in support of this opinion. But M. ANDRAL went still further, and conceived that "it enjoys, although not possessed of any distinct organisation, perhaps, a greater sum of vitality than the fibrous tissue which contains it, and consequently is more prone to become altered in its nutrition, and to separate from its own substance various morbid products."

77. M. ANDRAL has erred in imputing to this matter endowments and powers which it is not entitled to, and which are merely changes or modifications of this matter, owing to the states of the vital energies of the frame, especially as manifested in this viscus through the medium of the nerves supplying its bloodvessels and proper tissue,—this matter itself not being the active agent in producing those changes, but the passive recipient merely of the influence exerted on it by the organic nerves supplying the organ, and undergoing changes in consequence of modified states of this influence. Besides, as I have shown above (§ 4. *et seq.*), the views of these pathologists have been disputed in the more recent researches of KÖLLIKER, who has inferred, if he has not fully proved, that the spleen does not discharge the function which they have imputed to this organ, but, on the contrary, a very opposite one,—that it produces a solution of the blood-globules, depriving them of their colouring matter, and preventing the excessive abundance of coloured globules in the blood, which might otherwise occur.

78. i. THE CAUSES of organic lesions of the spleen are, chiefly and more remotely, those already mentioned (§ 14. *et seq.*); but there are others which more immediately and directly induce these lesions, and which consist of previous disease—of one or other of the affections already mentioned, or even of a combination of them—1st, of inflammatory action in some one of its grades, affecting chiefly the fibrous and muscular tissues of the organ; 2nd, of remarkable impairment of vital power and of organic cohesion; 3rd, of morbid states of the blood contained in, or circulating through, the viscus; and 4th, of various combinations of the preceding conditions. During the influence of depressing causes, moral or physical, the spleen often experiences a deficiency of vital contractile power; and it hence soon becomes turgescent, or inflamed if the causes commonly productive of inflammation are in operation, and very soon afterwards engorged and enlarged, or otherwise structurally altered. When the incipient symptoms are inflammatory, this state soon passes into organic change; and it is generally impossible to ascertain during life when the former terminates and the latter begins; the one passing insensibly into the other. With these successive changes, the blood-globules become more and more altered or dissolved, and the fibrine in the blood, or the corpuscles constituting fibrine, more abundant. During the changes of the blood, caused either by agents acting primarily on this fluid, or by disorders of depurating organs, the spleen also early and manifestly undergoes important alterations, for, not only is it more or less congested or enlarged, but its vital cohesion is also remarkably impaired, as shown by its state after death from malignant or adynamic maladies. Many of its organic changes, especially those which are chronic, may be imputed to the frequent occurrence of congestion, or of acute, sub-acute or chronic inflammatory action, or to the absorption of morbid matter, or to the accumulation of injurious elements, owing to impaired excretion.

79. ii. ALTERATIONS OF THE FIBROUS STRUCTURE OF THE SPLEEN.—*A. Lesions of the Capsule of the Viscus.*—These consist—1st, Of an unusual injection and congestion of its bloodvessels; 2nd, Of softening, in various grades, which may even be so great as to occasion its rupture; 3rd, Of its thickening, either with or without some degree of induration; 4th, Of its transformation into fibro-cartilaginous, cartilaginous, or even osseous substances. These changes are independent of, although very frequently connected with, similar alterations in the peritoneal envelope of the organ, and more especially with inflammatory changes, as effusions of lymph and serum, false membranes on the free surface, or thickening of the peritoneal covering, adhesions to adjoining organs or parts, &c.

80. *B. Alterations of the Trabecular or Fibro-Muscular Tissues and Parietes of the Splenic Cells.*—These are but imperfectly known. This part of the fibrous structure of the organ has been found, however, 1st, in a state of softening; 2nd, in a state of enlargement, rendering the septa thicker and more apparent than natural; 3rd, partially changed, in rare cases, into a cartilaginous or osseous substance. From this it will be perceived, that the changes of the internal fibrous structure of the spleen are nearly the same as those of its capsule. In respect of injection of the vessels ramified to it, and other inflammatory appearances, it may be remarked they cannot be so readily recognised in the internal, as in the external fibrous structure of the viscus.

81. iii. LESIONS OF THE SPLEEN SEATED IN BOTH ITS CONTAINING AND CONTAINED PARTS.—The alterations observed in the coagulated matter contained in the cells of the spleen evidently result from a change in the vital conditions of the organ, by which the internal arrangement of the particles composing this matter is modified. The only question here is, whether this modification takes place subsequently to the formation of this matter, or at the moment of its secretion? Most probably this modification results from the influence exerted by the nerves upon the vessels producing this matter, and is not the remote

consequence of changes experienced by it subsequently.

82. *A. Altered consistence of the spleen* is a very frequent occurrence, and seems to depend upon—1st, the state of its fibrous structure; and 2nd, upon changes in the consistence of the coagulated matter and blood contained in its cells and capillaries. M. Andral refers alterations in its consistence, as well as other lesions of this organ about to be considered, to the state of the blood which fills the splenic cells and capillaries. This is substituting the effect for the cause, although, doubtless, a dissolved state of the blood which the spleen contains will materially diminish its natural firmness. It is much more likely that changes of this kind, as well as the greater number of the lesions of this viscus, depend more upon the state of its organic nervous influence, and upon the vital cohesion of its fibrous structure, than upon the condition of the blood contained in its cells. It may be allowed that the coagulated matter and the blood contained in the spleen experience important changes; but these are surely not primary, but the effects of that influence to which I have now referred them. This view of the subject is supported by the physiological researches of Home, Tiedemann, Gmelin, Schmidt, Prout, and Béclard; and by the experiments of M. Dupuytren.

83. *a. Softening of the spleen* is a very frequent lesion; particularly in fevers. In this state the natural cohesion of the capsule and of the fibrous and muscular septa is diminished, and the coagulating matter and the blood contained in the cells, pulp, and capillaries of the viscus, have lost their natural crasis, so that they are readily washed out, leaving the fibrous structure entire. In some cases, the blood and the coagulating matter formed in the spleen are quite fluid, and the internal structure of the viscus so weakened and injured, generally from its diminished cohesion and great distension, that an indistinct sense of fluctuation is given upon examining the viscus externally. The spleen, when softened, is seldom diminished in size; it is generally either enlarged, sometimes greatly, or it preserves its natural volume. Softening with enlargement of this viscus is one of the most frequent lesions occasioned by adynamic or malignant fevers.

84. *b. Increased firmness or induration* of the spleen seems to result from augmented cohesion of the fibrous structure of the spleen and bloodvessels, or from a modified state of the coagulating matter contained in the cells of the viscus. In many cases of this description, the blood seems particularly dense, and together with the coagulated matter, gives to the spleen, when divided, the appearance of a slice of the liver. When the increased firmness of the organ amounts to *induration*, the change may be attributed partly to a cartilaginous degeneration of portions of the fibrous structure, to thickening or hypertrophy of this structure consequent upon protracted inflammatory irritation, and partly to the formation of an organised or partially organised lymph, or to a fibrinous deposit in the parenchyma of the viscus. Increased firmness or induration is frequently associated with alterations of size, especially *enlargement*. *Alterations of the size* of the spleen are chiefly referable to the same causes as changes its consistence, viz. to the vital cohesion of its structures, and of the blood and coagulated matte contained in it, and to the action of its differen vessels.

85. iv. Enlargements or Tumours of the Spleen may proceed — 1st, from the diminished cohesion and yielding state of the fibrous substance; 2nd, from diminished action of the veins and lymphatics; 3rd, from a greater quantity of blood being accumulated in the capillaries and cells than is carried out by the veins; and 4th, from a greater quantity of the coagulated matter being formed in, than is removed from, this organ. It is evident that the effect in question seldom proceeds from one only of the above causes, but generally depends, more or less, upon two or even a greater number of them.

86. *A.* When the spleen is much enlarged, it often ascends in the left hypochondrium, thrusts the diaphragm upwards, and, becoming more closely applied to the surface of the ribs, occasions as dull a sound on percussion as is heard in the right hypochondrium from the presence of the liver. Sometimes the enlarged spleen, pressing thus upwards, does not project beneath the margins of the ribs. In this case its enlargement can only be determined by percussion and auscultation. But more commonly it descends below the margins of the left ribs, occasioning a tumour, varying in dimensions and form. This tumour occupies the left hypochondrium, and may be so large as to extend to the left flank, to the epigastrium, and to the umbilical region. In some cases I have seen it so much enlarged as to extend to the right side of the abdomen. It should, however, be recollected that the spleen may form a tumour below the ribs without being materially enlarged, owing to the diaphragm being pressed downwards by an effusion of fluid into the pleural cavity. Instances of excessive enlargement of the spleen, with or without induration or increased firmness, have been recorded by authors. Columbus and Schenck record cases in which the viscus weighed twenty pounds, the fibrous envelope being nearly cartilaginous. Burrowes saw one which weighed twelve pounds, and J. P. Frank one that was sixteen pounds weight. The more chronic cases of enlargement are frequently attended by some degree of induration; whilst the more rapidly formed instances of enlargement, as frequently observed in the more pestilential or miasmal climates, are characterised by more or less softening or friability of the viscus.

87. *B. Chronic tumours or enlargements of the spleen* — vulgarly *ague-cakes* — are very different from the enlargements of the viscus which take place from *vascular congestion* (§ 22. *et seq.*), and which occur not infrequently in the course, or as a sequela of adynamic or exanthematic fevers, or other diseases. These tumours differ in character, and are owing partly to hyperæmia, partly to the deposition of the anomalous fibrous product already noticed in the parenchyma of the spleen. The consistence of the organ varies greatly. The tumour or enlargement is most probably at first soft, but becomes harder, according as the deposit is more coagulable, and as the more fluid parts are absorbed. The colour of the swollen or enlarged viscus is probably at first reddish, but becomes paler as the colouring matter is absorbed, and as increased vascularity yields, and gives place to the fibrous deposit.

88. *C. Diminished volume* of the spleen sometimes occurs, but much less frequently than increase of its size. Occasionally it is very much diminished. M. ANDRAL has seen it no larger than a walnut. In cases of this description, the consistence of its fibrous structure, and of the contents of its cells, may be either increased or diminished. With the causes of atrophy of the spleen, and of the particular circumstances connected with it, we are altogether unacquainted.

89. *D. The colour* of the spleen is occasionally considerably changed. In some cases it is of a bright red, deepening through all the shades to a blackish hue. When this occurs in spots only, the organ presents a speckled appearance. It sometimes also assumes, in certain portions, a whitish or yellowish tint; these portions either retaining the same consistence as the rest of the organ, or being harder or softer than it. It is difficult to say whether this change of colour depends more upon diminished vascularity of the fibrous structure of the part thus affected, or on change of the colour and consistence of the coagulated matter and blood contained in the parenchyma and cells of the viscus. M. ANDRAL imputes it entirely to the latter cause, and thinks it does not result from the formation of any new production.

90. v. MORBID FORMATIONS.—1st, *Purulent matter* is sometimes found in the spleen, either in isolated drops disseminated through its parenchyma, or in abscesses of various dimensions. These latter may here, as in the liver, be separated from the surrounding parts by a false membrane or cyst, or may be in immediate contact with, or pass insensibly into, the sound parts. Abscesses devoid of any cyst sometimes acquire a large size, occupying the greater part of the internal structure of the viscus. In these cases, the surrounding parenchyma is generally soft, pulpy, and readily breaks down notwithstanding the utmost care. In the parts most distant from the collected matter, the capsule and fibrous tissue generally remain unchanged; but when the capsule comes in contact with the purulent matter, it also loses its vital cohesion, and allows the collected matter to find its way through it, either into the peritoneal cavity, or, having formed adhesions to adjoining viscera, into them. Abscesses of the spleen may thus burst into the stomach, the colon, the thorax, and even into the urinary passages. Cases have also been described, wherein they have found their way, externally through either the anterior abdominal parietes, or the back, or even the loins; but such occurrences are extremely rare.

91. Infiltration of purulent matter into the parenchyma of the spleen, as well as its collection in distinct abscesses, may coexist with similar depositions in other parenchymatous organs. Thus pus has been found in the spleen, liver and lungs, and even in the brain also, of the same subject. It is sometimes found in one or more of these organs and in the cavities of the joints in the same case. In all these cases the pus is formed in some other part, as in the veins, in the sinuses and cavity of the uterus, &c., whence it passes into the current of the circulation, and is either deposited in these situations, or occasions an inflammatory state of these parts, rapidly followed by the suppurating process. For reasons assigned in another place (see arts. ABSORPTION, ABSCESS, *symptomatic*, and VEINS, *diseases of*), I believe that the latter more commonly obtains. In some instances, as in phlebitis, metritis, &c., purulent matter is formed in the part primarily affected, and subsequently appears in the spleen only; but more generally it is also found in some other situations at the same time. The majority of instances, in which purulent matter is found in the spleen, are of the above description. Those instances in which the pus has proceeded from inflammation, acute, subacute or chronic, originally affecting the substance of this viscus, are not common, unless as a complication of remittent and intermittent fevers; but in these cases of primary formation of matter in the spleen, according to my experience, a distinct abscess or abscesses are found, and rarely infiltration only, this latter being always a consecutive deposition or formation.

92. 2nd. *Tubercular matter* is not infrequently found in the parenchyma of the spleen, generally in the form of minute grains, either isolated or clustered together. Tubercles of this organ are much more common in children than in adults; but they seldom are found in it, at any age, unless they exist in other organs at the same time. Tubercles are very common in the spleen of the lower animals.

93. 3rd. *Cysts*, of various kinds, are occasionally found in this organ. Their simplest form is that of small vesicles filled with a serous fluid, existing either singly or in clusters. These vesicles are sometimes found in great numbers. M. ANDRAL states, that they are not confined to the splenic cells, he having found them within the splenic veins, some floating loose, others attached by peduncles to the sides of the veins, and others again lodged between their coats. He has also observed cysts of a much more complicated structure in the spleen: these consist of a serous, or sero-fibrous tissue, containing either a honey-like matter, or a substance resembling suet, interspersed with hairs. *Hydatidic* cysts are sometimes found in the spleen, but not so frequently as in the liver. Their mode of development in the former is in every respect the same as in the latter (see art. LIVER, § 232.).

94. As to *the origin* of the above formations much difference of opinion exists. M. ANDRAL supposes that they are nothing else than the blood contained in the splenic cells modified in its qualities. "The experiments of M. GENDRIN," he observes, "seem to prove that the blood may be converted into pus. The result of my own observations has convinced me that, by a simple alteration of its colour and consistence, it may be converted into a substance perfectly analogous to the encephaloid tissue described by LAENNEC. Let us go a little further, and suppose the blood in small circumscribed masses deprived of its colour, and diminished in its consistence, so as to become curdy and friable, and we have then all the essential characters of tubercles." (*Anat. Path.*).

95. The changes which M. ANDRAL supposes to commence in the blood contained in the spleen should rather be referred to an alteration of the coagulated matter or lymph formed by the vessels ramified on the parietes of the splenic cells; both because the morbid deposit is more immediately produced by the vital action of this viscus and of its vessels, and is not a fluid circulating merely

through it, and there arrested in its course; and because the morbid productions to which this author has referred, particularly tubercles and encephaloid tissue, have closer points of similarity to this particular coagulated matter than to the blood itself. Besides, we have no proofs that blood ever undergoes changes, similar to those for which M. Andral contends, from being contained in, or circulating through, the capillaries or cells of an erectile tissue. Whatever changes the splenic blood may undergo, must result either from the state of organic nervous or vital influence, with which the spleen is endowed, or from the condition of the blood circulating in it, or from the properties of the coagulated matter which it is engaged in forming, supposing that this matter mixes with the blood taken up by the splenic veins. These causes may combine to produce the ultimate effect; but the first should be viewed as primarily and chiefly influential, and the latter as early results, inducing further effects.

96. The *proximate causes* of the foregoing lesions of the spleen may depend—1st, upon irritation in various grades up to acute inflammation; such as increased vascularity, induration, ossific change, primary formation of matter, &c.; 2nd, on a diminution of the nervous and vital influence of the organ, affecting the action of its vessels and its functions, and the state of the blood contained in the capillaries of its proper structure and cells—as softening, changes of colour, congestion, enlargement, &c.; 3rd, on obstructed return of blood through the veins, as from organic disease of the liver or of the heart, especially congestion, enlargement, induration, &c.; 4th, on a tendency existing in the system to the formation of the matters found in the spleen—as pus, tubercles, cancerous matter, cysts, &c. This tendency may depend on the local or general states of vital influence; or the substance found in the spleen may be conveyed through the channel of the circulation, and deposited or secreted in this situation. It is possible also that both these may concur.

97. vi. **Hæmorrhage in the Spleen.**—*Apoplexy of the spleen*, Cruveilhier. — This able pathologist has described the hæmorrhages sometimes met with in the substance of the spleen, especially in the course of intermittent fevers. Hæmorrhagic deposits of various sizes, rounded in form, and exhibiting all the changes which the blood undergoes in apoplexy of the brain or other organs, are the appearances usually presented in cases of splenic apoplexy. Ochry-brown cicatrices and fibrous cysts of the same colour, observed in rarer instances, may be viewed as the remains of former hæmorrhages, with breach of substance. Hæmorrhagic effusion into the parenchyma of this viscus should not be confounded with pulpy softening of this viscus, from which it is altogether distinct. M. Cruveilhier remarks, that, at every strong muscular effort, the blood rushes into the structure of the spleen, distending it, and thereby causing rupture. What renders this opinion the more probable is the frequency of hæmorrhage in the spleen of the horse. M. Bailly has also adduced cases of spontaneous hæmorrhage into the substance of the spleen from ague.

98. vii. The Diagnosis of organic diseases of the spleen is extremely difficult as regards certain of them, and very easy as respects others. Enlargement and induration of this viscus are readily recognised, unless they be slight or incipient. The existence of *abscess* of the spleen is to be inferred from the history of the case and the symptoms mentioned above—especially when the acute disease has passed the sixteenth day, the viscus increasing in size,—if fever be exasperated towards night, with increased heat in the soles of the feet and palms of the hands,—if rigors appear, followed by flushes, perspirations, and a soft pulse,—and if the complexion become more pallid, leaden, or sallow, and the bowels more relaxed. The existence of the other organic lesions of the spleen is often not manifested during life, and can very rarely be inferred with the least precision, either from the history of the case or from the symptoms complained of. Pulpy softening, however, when accompanied with more or less tumefaction, may be suspected from the softness and tenderness of the swelling and the antecedents of the case, but the examination ought always in such instances to be conducted with gentleness and care; for the spleen may be ruptured during life by a rough examination, especially in the advanced stage of remittent fever, during which this state of the spleen chiefly occurs.

99. viii. The Prognosis of structural changes of the spleen entirely depends upon the nature of these changes, many of which cannot be ascertained during life. The existence of *abscess* is always dangerous, but not always fatal, as recovery may take place in the manner already mentioned. *Enlargements* of the viscus are always serious maladies; but, when they are not excessive, are not associated with obstructed liver or disease of the heart, are not accompanied with a boggy or pulpy feel upon examination, or extreme hardness, they may either be removed, or the patient may live some years without change in the tumour or in his general state. If the enlargement be pulpy or boggy, if it be attended by much tenderness or pain, or by extreme hardness, or accompanied with protracted diarrhœa, or with exhausting hæmorrhages from either the stomach or bowels, or with disease in the liver or other organs, or with abdominal dropsy, the prognosis should be very unfavourable. In all cases of inferred alteration of the spleen, the constitutional symptoms and the complications should guide the prognosis, especially the apparent amount of vital power, of vascular fulness, or of anæmia, and the connection existing between it and diseases of other organs.

100. ix. The Treatment of structural diseases of the spleen has been in great measure stated when noticing the treatment of chronic splenitis. The chief and most common changes of this viscus, which come under the care of the physician, are *enlargement* and *induration*, and these are the usual consequences either of acute, sub-acute or chronitic splenitis, or of repeated attacks of congestion, caused by obstinate agues, especially in miasmal localities. After having recourse to purgatives, in the combinations already mentioned, more especially with sulphate of quina, sulphate of iron, &c. (§ 60. *et seq.*), and to liniments and embrocations applied over the splenic region, these morbid conditions generally disappear; but, if they still continue, the *iodide of potassium* may be prescribed in connection with such other means as

the peculiarities of the case may suggest, as with the compound decoction of aloes, or the compound mixture of iron, or with both; or the iodide of iron may be taken in the syrup of sarza. In those cases frictions of the surface of the body, especially over the hypochondria, with the liniments already mentioned, will prove very beneficial. During the treatment of these chronic and obstinate diseases of the spleen, due attention should be directed to the disorders which are so frequently associated with them, and more especially to obstructions or other affections of the liver, and disorders of the stomach and bowels.

101. In many cases of chronic enlargement or induration of the spleen, especially when associated, as either lesion very frequently is, with chronic disease or torpor of the liver, the *nitro-muriatic acid*, taken in the infusion of chereita or of calumba, with extract of taraxacum, and the external use of this acid, either as a bath to the extremities, or as lotion, wash, or epithem over the hypochondria, will prove most beneficial. If hæmatemesis or discharges of blood from the bowels occur, the state of the case should be duly weighed. If the patient have lived fully or richly, if he be young, plethoric or robust, the hæmorrhage may prove more or less critical, and should not be prematurely arrested. In different circumstances, or when it proceeds too far as respects the condition of the patient, the arrest of it may be generally accomplished almost immediately by the spirits of turpentine, taken either in a full, or in small and frequently repeated doses, as prescribed above (§§ 62. 69.).

102. When amenorrhœa or chlorosis is connected with enlargement of the spleen, the combination of the compound steel mixture with the decoction of aloes, or the aloes and myrrh pill with the compound galbanum pill, may be prescribed and continued for some time, or the other medicines just now recommended may be taken, but due reference should always be had to the history of the case, and its various morbid relations.

103. *Change of air* is the most important means of cure in all chronic affections of the spleen, and more especially when the patient resides in a low, humid or miasmal locality, or in a hot and aguish or sultry district. Change to a more healthy climate, as far as this may be effected, or even a sea voyage, is essentially necessary to a complete or permanent recovery. When change of air can be associated with the use of *chalybeate* and *deobstruent mineral springs*, or artificial mineral waters of this kind, then the advantages of change will be very materially enhanced. Many of the chalybeate, saline chalybeate and sulphureous waters of this country, of Scotland, Germany, &c., will prove very serviceable in completing a cure of splenic disease; but the particular spring which should be adopted ought to depend upon the peculiarities of particular cases.

104. The *diet* and *regimen* of the patient require strict attention, and should be duly regulated. If the patient live in, or have been removed to, a healthy air and locality, an abstemious or moderate and digestible diet, with temperance in the use of vinous or other beverages, will of itself, in due time, effect a cure; but this regimen should generally be only brought in aid of the treatment already advised, adapted with discrimination to the circumstances of each case. Care ought to be taken never to overload the stomach. Farinaceous articles of food should be taken in due proportion, and animal food only once in the day, in moderate quantity. Instead of the usual kinds of flesh meats, the more digestible kinds of fish — white fish — may be substituted twice or thrice in the week; but the fish ought never to be fried. Cocoa should be preferred to tea or coffee. Moderate exercise in the open air and in sunshine ought not to be neglected, more especially when splenic affections are accompanied with anæmia or chlorosis.

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STAMMERING—See art. Voice and Speech, Disorders of.

STERILITY—See Impotence and Sterility, also, Pollution, Voluntary.

STOMACH, DISEASES OF,—Comprising Cardia and Pylorus.—Synon.—Stomach, Γαστὴρ, στομαχος;—*Ventriculus, Stomachus*;—*Magen*, Germ.;—*Ventricule, Estomac*, Fr.;—*Stomacho*, Ital.

1. The stomach not only sympathises most intimately with other organs, but also exercises over them a most powerful influence: it is not merely a passive sufferer of disorder on numerous occasions, but is, on many others, itself either actively diseased, or the most influential agent of the disorder of other organs. Hence, in many diseases, even of the most serious kind, the stomach is either chiefly affected, or most intimately sympathises with the organ which is the seat of the disease. (See art. Sympathy.)

2. In most affections of the stomach, and in many diseases with which this organ sympathises, there are certain prominent symptoms which may be—1st, functional, or independent of any appreciable structural change of the organ or of any other part; 2nd, or be caused by inflammatory, or by organic lesion of the viscus; 3rd, or arise from disease of some allied organ or part, or even of the frame generally. These prominent and frequent symptoms are—*flatulence, acidity, heartburn, acrid eructations, water-brash or pyrosis, rumination, gastrodynia, nausea, and vomiting*, &c.; and as several of these may depend upon disorder of other viscera as well as of the stomach, the special consideration of them has been assigned to different heads, chiefly to Morbid Appetite, Flatulence, Indigestion, Digestive Canal, Gastro-enteric Disease, Pyrosis, Rumination, Vomiting, &c.; and to these articles I beg to refer the reader for various topics intimately connected with those involved in the present subject.

3. In our investigations of diseases of the stomach, the organisation, the structural, the nervous, and the vascular connections of the organ, the viscera bounding, and in close contact with it, and the varying states of its fulness and vacuity, should severally receive attention, especially in connection with habits and modes of living, with diet and regimen, with age and sex, and with artificial or injurious modes of dress. These severally, or more or less associated, modify not only the states, but also the position, not of the stomach merely, but also of surrounding viscera. *The functional disorders* of the stomach have been duly discussed under certain of the heads now enumerated, especially *flatulence* and *indigestion*; but before I proceed to consider the inflammatory and structural diseases of the organ, I shall offer a few remarks on the more painful affections usually referred to this organ, and which have generally been termed *gastrodynia* and *gastralgia*.

4. I. Painful Affections of the Stomach.—Synon.—*Gastrodynia* (from γαστὴρ, stomach; and ὀδύνη, pain);—*Gastralgia* (from γαστὴρ, and ἀλγέω, I suffer pain);—*Cardialgia* καρδιαλγια, Sauvages, Darwin, Pinel, &c.;—*Spasmus ventriculi, Cardiaca passio*, Auct.—*Limosis Cardialgia*, Good;—*Morsus ventriculi, dolor ventriculi*, Auct. Var;—*Doleur de l'estomac, Colique d'estomac*, Fr.;—*Magenschmerz, Magenkrampf, Magendrücken*, Germ.;—*Mal di stomaco*, Ital.—*Pain in the stomach; cramp or spasms in the stomach; nervous affection of the stomach.*

Classif.—II. Class, III. Order (*Author in Preface*).

5. Definit.—*Severe, sometimes violent, pain in the region of the stomach, often of sudden occurrence, and, after an indefinite continuance, generally quickly ceasing; frequently eased by pressure, and unattended by tenderness or fever; commonly symptomatic, and very rarely primary, unless produced by injurious ingesta.*

6. The very painful seizures, commonly referred to the region of the stomach, and usually termed *gastrodynia*, or *gastralgia*, or *gastro-enteralgia*, are very generally viewed as affections of the nerves supplying this organ, such affections being often accompanied by more or less spasm of the muscular coats of the viscus. This view is probably correct, although the evidence in its support is by no means demonstrative; for the morbid sensibility constituting the seizure may have its origin either in the nerves distributed to the stomach, or in the ganglia or plexuses, whence these nerves proceed, or in those in the more immediate vicinity, as in the diaphragmatic nerves; or it may even be caused by the irritation and spasm produced by biliary calculi. The existence of spasm of the gastric muscular coats is often doubtful; in some cases the pain presents spasmodic features; in others, it is not thus characterised. That the pain occasionally extends to both stomach and bowels, as inferred by some writers, the affection being in such cases called *gastro-enteralgia*, may be admitted; as it is difficult in all instances to dissociate the affection of the nerves of the stomach from a similar affection of the intestinal nerves, either co-existing or supervening the one on the other. This more extended affection will thus very nearly approach to the severer forms of colic or ileus, especially when the suffering in this latter affection is more or less referred to the epigastrium.

7. *Gastrodynia* occurs under a variety of cir

cumstances:—1st, it may be altogether nervous or functional, and unconnected with any evidence of inflammatory or structural lesion; 2nd, it may depend upon various grades or kinds of inflammatory action; 3rd, it may proceed from any of the structural lesions about to be considered; and 4th, it may be connected with gout, appearing in the form of atonic, misplaced, or metastatic gout, or even with rheumatism, although very rarely with this latter. It may, moreover, occur sympathetically of various other diseases, especially those which are seated in the abdominal viscera. The first of these manifestations of gastrodynia chiefly interest us at this place. In this state of the disease, as well as in the other, the secretions poured into the stomach are often much disordered, most frequently they are more or less acid. The acidity in these cases is either the cause of the pain, or the consequence, in the first instance, of the functional disorder, of which morbid sensibility constitutes a chief part, the pain being increased by the acid or morbid fluid and gaseous secretions produced during the impaired organic nervous or vital power of the stomach.*

8. This affection may occur in very different or even opposite states of the stomach. It may appear during inanition, or, at least, during an empty state of the viscus, or after repletion or an overloaded condition of the organ. It may be connected with anæmia, or with great vascular fulness. It may be referred to the nature or incongruity of the ingesta, or to flatulent distension; and it may be associated with any of the functional or structural affections of the stomach already noticed (§§ 2, 7.). In its severer forms, gastrodynia is sometimes associated with a morbid appetite or with gout, and in this latter state it often assumes the form of *cardialgia*,—a form which many writers have described as a combination of gastrodynia with leipothymia, the distress being referred equally to the epigastrium and the præcordia. Gastrodynia, in its less violent forms, is often an attendant upon difficult or scanty menstruation, but it still more frequently assumes the form of gastro-enteralgia, or even of colic, in females who experience catamenial or uterine disorder. The more sudden and violent accessions of pains, with the shorter continuance, and more rapid cessation of suffering, has been referred to cramp or spasm of the viscus; but, even admitting this condition to exist in these cases, a neuralgic state of the nerves of the viscus, or of those in the immediate vicinity, owing probably to some temporary irritant, may equally constitute the pathological condition; in either case the one morbid state will hardly exist, with much violence, without the other. Broussais and his followers would not admit the existence of either of these conditions independently of inflammatory action or structural change. This view of the complaint is sufficiently controverted in the article on Gastro-enteric Disease, and in what will appear in the sequel; the most severe states of gastrodynia often appearing under very different circumstances from those of inflammatory action or structural lesion.

9. i. The Causes of gastrodynia are remarkably numerous, and nevertheless it is sometimes difficult to assign the attack to any particular cause. The affection is frequently connected, more or less, with temperament and habit of body—with the nervous, irritable or bilious; and is hence somewhat hereditary. It is much more frequent in the female, than in the male sex, especially during uterine activity, and in the form of spasm or of cramp; in the nervous and susceptible; in persons of sedentary habits; in the insufficiently or unhealthily fed; and in those who are subjected to anxieties of mind and to the depressing emotions. Females are most liable to it about the period of the catamenia, and during gestation; also after large losses of blood, and prolonged leucorrhœa. It is often associated with anæmia, or chlorosis. Gastrodynia, in its severer forms, is one of the most frequent consequences of masturbation, in either sex; of a vegetable, poor and indigestible food; of taking cold and acid beverages or fluids, especially during an over-heated state of the system; or acid and unripe and stale fruits; of living in low, humid, and unwholesome localities; of intemperance in the use of spirituous or vinous liquors; and of the more indigestible or incongruous articles of diet, or of excessive repletion, produced either by food or drink The causes enumerated under the head of Appetite, Morbid, Flatulence, Indigestion, &c., are equally productive of the affection now being considered.

10. ii. The Symptoms of gastrodynia consist of the character, mode of accession and duration of the pain, and of the associated phenomena. The

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* The following remarks, pertinent to this subject, have been published by Dr. Bence Jones, who has most ably investigated this and many other topics in animal chemistry.

"In 1785, Carminati first observed the acid reaction of the digestive fluid. Werner, in 1800, confirmed the observation. Prout proved, in 1824, the presence of hydrochloric acid during digestion and in indigestion. Tiedemann and Gmelin found, in 1826, by irritation of the stomach, that acid was secreted; chiefly hydrochloric acid. They found also traces of acetic acid; and in the horse they found also butyric acid. About 1830, Berzelius states that the acid reaction of the contents of the stomach is chiefly from hydrochloric acid, and the acids next in importance are the lactic and butyric. He concluded, from his own experiments, that lactic acid existed in all animal fluids, either free or combined. In 1844, Liebig showed that this conclusion was not correct,—that there was no lactic acid, even in milk, until it began to decompose; and this he showed to be true of other animal fluids. In 1815, I (Dr. Bence Jones) observed that when much acid is secreted by the stomach, the urine is found to be alkaline The excess of acid in the stomach was hydrochloric acid; and the free alkali in the urine was fixed alkali, and not ammonia. In extreme cases, the alkalescence lasted for four hours. As the free acid was absorbed from the stomach, the urine became acid, and this reaction increased until it was intensely acid to test paper. Thus, then, in health and disease, hydrochloric acid is liberated in the stomach. Acetic acid is sometimes present in small quantities, and perhaps lactic and butyric acids may occasionally be found. Phosphoric acid has not hitherto been proved to exist in the gastric fluid.

"The progress of animal chemistry leads to the expectation that many more organic acids will be found to be present in the stomach in disease. Starch and fat are two of the three great constituents of the food of man, and each gives origin to a long series of organic acids; the last of which in either case is carbonic acid, the product of respiration.

"The varying circumstances of disease render it probable that in disorders of the digestive organs, many of the intermediate acids may be produced; that, although in the state of health the starch passes readily into carbonic acid and water, yet in the state of disease, lactic acid, acetic acid, and formic acid, may be produced. So, also, one or many of the fatty acids will most probably be found to result from indigestion. Thus, butyric, caproic, and caprylic acids closely related to each other in composition, are not unlikely to be present in the secretions of the stomach in disease." (See Dr. Seymour, *on the Nature and Treatment of several severe Diseases*, &c., vol. i. p. 3.)

pain may be acute, pungent, lacerating, cutting, burning, or obtuse, dull or aching. It may be sudden, rapid, or slow in accession; and after continuing momentarily, or for a very short, or even an indefinite time, cease suddenly, quickly, or slowly. It may remit or intermit, or recur at irregular or indeterminate periods. It may occur at any period of the day or night, especially the former, and in every state of the stomach, more particularly when empty or overloaded. It may be attended by great distress and appearance of suffering; by constant restlessness, agitation, tossing, or even convulsive or spasmodic movements; by extreme anxiety, anguish, palpitations, tumultuous or irregular action of the heart, or by epigastric pulsations; by groaning, moaning, and irregular states of respiration, both diaphragmatic and voluntary; by choking in the throat, eructations of flatus, or partly of flatus and of acid, rancid or even alkaline matters, or the more forcible rejection of nidorous or variously disagreeable fluids. There are frequently borborygmi, flatulent distension at the epigastrium, and often in the other abdominal regions, sometimes with irregular spasmodic contractions, and efforts to vomit, the attempts being either abortive, or partially inefficient. The skin is often cool, especially the extremities, and the sufferings occasion a free or cold perspiration. Pressure of the gastric region generally affords a temporary ease. The countenance is anxious or partially sunk; the tongue is not materially changed from pre-existing states; the appetite may be morbid, ravenous, or lost, with or without nausea or retching. Thirst may or may not be experienced; and the bowels may be costive or irregular, and the stools more or less morbid. The urine may be pale and abundant, especially in females, when the gastrodynia is associated with uterine disorder. The pulse may not be materially affected, or it may be slow, intermittent, or irregular; or it may be small, quick and irregular, whilst the action of the heart is hurried and tumultuous. Retchings or *vomitings* may or may not be present; but when the latter are observed, they are such as are described in that article.

11. iii. Diagnosis. — It is often difficult to determine whether the pain, attended by more or less of the above symptoms, be purely nervous, or the more prominent phenomenon, caused by spasm, or by inflammatory or organic disease of the stomach, or of a closely adjoining part. The history, the concomitants, and the grouping of the symptoms of the case, will chiefly guide the physician. The causes of the attack ought to be carefully investigated before a positive opinion be formed or given. Attention to these: the absence of fever, of tenderness on pressure, or of tension, or of increased heat near the seat of pain; the state of the urine, and of the secretions generally; the free perspiration and coolness of the surface; the character of the pulse, and even of the pain in most instances; the existence of the nervous temperament, or of the hysterical or gouty diathesis; the *juvantia* and *lædentia*, the effects of treatment, the habits, modes of life, the cravings, and the diet of the patient, will severally assist the diagnosis.

12. When the pain is caused chiefly by, or is connected with, *spasm* or *cramp of the stomach*, the morbid action, as Dr. Macfarlane has shown, in a very excellent paper on this subject, is communicated by the nerves to the muscles, inducing the most acute pain, with a feeling of rigid contraction, violent twisting or tearing in the epigastrium, soon followed by painful or interrupted breathing, difficult articulation, pallid countenance, small, hurried and contracted pulse, and occasionally with coldness of the extremities, and rigid contraction of the recti abdominis and gastrocnemii muscles. Pressure on the gastric regions in these cases, instead of increasing the pain, as in inflammatory and organic diseases of the stomach, generally affords more or less relief in this affection, which in some instances is followed by an attack of hiccup.

13. In all cases of gastrodynia, the nature of the ingesta, not only for a few hours previously to the attack, but also for several days, ought to be ascertained as accurately as possible; for the poisonous, injurious or incongruous nature of these may have occasioned the attack; and, although inflammatory action may be the concomitant of the gastrodynia, this latter may be the chief lesion, the former being either asthenic, or of a kind which should be viewed as altogether subordinate. The nervous character of the complaint is sufficiently manifest in many cases; but in certain circumstances, especially when occurring in the gouty or rheumatic diathesis, or in the form of displaced gout, it is sometimes associated with congestion, or with asthenic inflammatory action; and much greater importance is frequently, in such cases, attached to these latter pathological conditions, than to the state of the organic nervous power and vital resistance, which are too often allowed to sink, or which are even hastened to collapse by lowering or inappropriate means.

14. iv. The Prognosis of gastrodynia is generally favourable when the attack is not attended by tumultuous, or irregular, or intermittent action of the heart, or by leipothymia, or by a sense of fatal sinking, or a presentiment of approaching dissolution. These often accompany misplaced or metastatic gout, or the occurrence of severe gastrodynia in the gouty diathesis, or an attack in a person who is already the subject of organic disease of the heart, and should be viewed as extremely dangerous symptoms, although no indications of inflammations or structural change be present, or may be detected in the stomach or collatitious viscera after death. Several instances of this kind have come before me, one of them in a medical man. If the attack occurs in a person far advanced in life, or addicted to the abuse of spirituous or vinous potations, the existence of organic disease in this organ, or in its collatitious viscera, may be inferred, especially if singultus be present, and a prognosis may be formed accordingly. Nevertheless, the attack may not be the less nervous, this being the most important part of the disease, as respects the existing suffering, and that to which immediate attention should be directed, as respects both the prognosis and the treatment. In the severer form of gastralgia, attended by the symptoms of cramp or spasm of the stomach, a cautious prognosis should be given. In a case published by Dr. Macfarlane (*Glasgow Med. Journ.* vol. ii. p. 182.), of cramp of this viscus, the coats at one part, were found completely torn asunder, so as to produce a large opening, no appearance of disease having been

detected in the vicinity or in the margins of the aperture.

15. v. TREATMENT.—The *indications* of cure are —1st, to allay the suffering of the patient; and 2nd, to prevent a return of the attack by ameliorating or removing the morbid conditions occasioning it.—*A.* The *first* of these is often best accomplished by ascertaining and expelling the cause of disorder, more especially when poisonous or injurious ingesta has produced it. In such cases, the treatment should be directed as very fully stated, with reference to the individual *poisons*, at the places where these are considered; for the removal of these, by an emetic, or by mechanical means, as there advised in respect of numerous injurious substances, or the neutralising or counteracting their actions, is most essential to the obtaining of relief, whenever the attack can be traced to these causes. If the attack be attended by vomiting, or by eructations, the state of the matters thrown off should receive attention; and if these furnish indications of acidity, the combination of antacids with emollients and anodynes are required. If the gastrodynia be characterised by cramp or spasms, rather than by acidity, antispasmodics and emollients should be given in frequent or large doses, with opium, camphor, æther, ammonia, &c. The following will generally afford relief:—

No. 342. ℞. Magnesiæ Calcin. ℈ij.; Tinct. Opii ♏xxxvj.; Spirit. Carui ʒij.; Aquæ Flor. Aurantii, Aquæ Pimentæ, ää ℥iijss. Misce. Capiat æger cochl. iij. larga, omni horâ, vel bihorio.

No. 343. ℞. Mist. Amygdal. dulc. ℥vss.; Acidi Hydrocyanici diluti. ʒss.; Tinct. Opii ʒss.; Spirit. Lavand. comp. ʒij. M. Fiat Mist. cujus sumantur cochl. iij. larga, secundis vel tertiis horis.

16. Whilst these or other appropriate medicines, as may be found in the APPENDIX (see *Form*, No. 357.), are being employed, either of the *embrocations* there prescribed (see *Form*, 311.), may be applied by means of warm flannels or spongiopiline over the epigastrium. When the pain is attended by retching, it is sometimes beneficial to promote vomiting by copious draughts of warm emollient fluids, in order to dilute and promote the discharge of irritating ingesta, or of morbid secretions. After these have been duly evacuated, it is often requisite to allay both the irritability and the morbid sensibility of the organ by giving, along with each dose of either of the above medicines, one of the pills now prescribed.

No. 344. ℞. Creasoti ♏ij.; Pulv. Cretæ comp. ℈ij.; Syrupi Papaveris q. s. M. Fiant Pilulæ xij. capiat unam vel duas, pro dose.

17. When the gastrodynia is accompanied with much flatulence, or assumes a milder and more chronic form, or recurs frequently, the following may be taken, and repeated according to circumstances.

No. 345. ℞. Magnesiæ Calcinatæ (vel Sodæ Carbon.) gr. xij.—xvj; Pulv. Rhei gr. viij.; Pulv. Cascarillæ (vel Pulv. Calumbæ) gr. v.; Pulv. Cinnamom. comp. gr. iij.; Aquæ puræ ℥iss. Misce. Fiat haustus.

No. 346. ℞. Bismuthi Nitratis, et Magnesiæ Carbonatis, ää gr. x. ad xij.; tere cum Mucilag. Acaciæ ʒjss. dein adde, Aquæ Flor. Aurantii ʒij.; Spirit. Anisi ʒj.; Tinct. Hyoscyami ♏xxv.; Aquæ puræ ʒx.; Syrupi Tolutani ʒss. Misce. Fiat Haustus statim sumendus et horas post tres repetendus.

18. If the pain in the stomach be connected with biliary disorder, a full dose of calomel and opium may be given at first—from five to ten grains of calomel, and from one to two of opium; and afterwards magnesia and rhubarb may be given in any aromatic water. If there be reason to infer that hydrochloric acid is present in the stomach, either vomiting should be provoked, or absorbents exhibited previously to the calomel; and if the retention of the latter by the stomach be doubted, a drop of creasote may be given in addition to opium, or morphia. The gastrodynia caused by the retrocession or suppression of gout requires very decided means. I have seen several cases of this kind, and each one was somewhat different from the others in its features, and in the effects produced by treatment. In one case (of a medical man), the attack was associated with enteralgia; in another, it was complicated with marked biliary disorder; in a third, it was attended by great disorder of the urinary organs. For the first magnesia, camphor, opium, and capsicum, were freely given in conjunction; for the second, magnesia, calomel, and opium; and, for the third, the carbonate of soda, with camphor, carbonate of ammonia, and hydrocyanic acid. For all of them, terebinthinate embrocations were directed to the abdomen, and mustard cataplasms to the feet. The results were favourable in all. The treatment should vary with the peculiarities of each case; and these are so many, and often so different, according as the pain is associated with disorder of organs with which the stomach is connected by position or sympathy, that it is impossible to state all the means, or combination of means, which will be quite appropriate to all.

19. *B.* Having removed the present attack, it is requisite to ascertain, as fully as possible, the conditions of the several digestive and excreting functions, and to trace the influence which disorder of any of these may have in favouring a return of this affection. In most cases of gastrodynia, more or less indigestion or weakness of the digestive functions generally, or impaired action of the liver, and disorder of the excreting functions, are present, not merely for a short period, or contingently upon some manifest cause, but in a chronic or protracted form; and for these a well-devised course of treatment is necessary both to remove them and to prevent their recurrence. Biliary accumulations or obstructions should be removed by chologogue purgatives; weakness of the stomach, by bitter infusions, or other tonics; torpor of the liver, by mild mercurials, taraxacum, or the nitro-muriatic acids, according to circumstances; impaired excreting function, by diuretics, diaphoretics, aperients, emmenagogues, warm baths, &c. Acidity of the prima via ought to be prevented by antacids, as the fixed and volatile alkalies, magnesia, chalk, &c., conjoined with tonics or aperients, or even with both. Antispasmodics, carminatives, and anodynes may be added to these, according as indications for their use may appear, with a view of preventing, as well as of removing, an attack of gastrodynia, which may occur in females, especially about the period of the catamenia, or in nervous or irritable persons from errors in diet, although no very manifest disorder of any of the abdominal organs can be detected.

20. There is no disorder for which a duly regulated diet and regimen are more required than for gastrodynia. As to the *diet*, which is found

the best in this complaint, it is most difficult to determine. Articles of food which agree well in some cases, disagree in others. Pure cocoa, black tea in small quantity; farinaceous articles of diet; animal food in moderation, and chiefly mutton or game; and abstinence from saccharine substances, from pastry and from heating beverages, are generally deserving of adoption; but it is unnecessary to add to what is already advanced on this subject, and on *regimen* and the use of *mineral waters*, when treating of INDIGESTION (see § 55. *et seq.*), with which the complaint is so intimately allied, and of which it so frequently forms the most distressing part.

21. II. INFLAMMATIONS OF THE STOMACH. — SYNON. — *Gastritis* (from γαστηρ, the stomach); *Ventriculi Inflammatio*, Boerhaave;—*Febris Stomachica Inflammatoria*, Hoffmann; — *Cardialgia Inflammatoria*, Tralles; — *Gastritis*, Sauvages, Vogel, Cullen, Parr, Pinel, &c.; — *Cauma Gastritis*, Young;—*Empresma Gastritis*, Good; — *Gastrite*, *Inflammation de l'Estomac* Fr.; — *Entzündung des Magens*, *Magenentzündung*, Germ.; — *Inflammazion des Stomaco*, Ital.

CLASSIF. — 1. *Class*, 2. *Order* (Cullen); — 3. *Class*, 2. *Order* (Good); — III. CLASS, I. ORDER (*Author in Preface*).

22. DEFIN. — *Anorexia, nausea, with pain in the region of the stomach, with or without chills or rigors; followed by febrile symptoms, by vomitings soon after the ingestion of substances, by a desire for cold fluids, by increased pain and tenderness on pressure, and, in the severer cases, attended by an internal sense of heat or burning, by extreme anxiety and dejection of mind, and by irrepressible vomitings or retchings.*

23. It is of some moment, upon entering on the consideration of inflammations of the stomach, to keep in recollection the organisation and the connections of the organ, and more especially the intimate structure of its villous coat, the nerves which supply it, which actuate its vital functions, and which forms the bonds of sympathy between it and the brain, spinal cord, and associated viscera; and the relations, functional and structural, between the enveloping serous covering and surrounding viscera, on the one hand, and the internal surface of the other portions of the alimentary canal on the other;—duly to consider the very intimate connection subsisting between this viscus and the chief ganglial centre; the analogy, presented by the digestive canal and vessels proceeding from it, to the roots of plants; and the general type of conformation existing, in respect of this organ, throughout the whole animal creation.

24. Before proceeding to discuss the several forms or states in which gastritis occurs, I shall consider the causes of the disease, as they are chiefly concerned in producing or modifying these states; the morbid effects generally presenting a more or less manifest relation to the causes or concurrence of causes producing them.

25. i. CAUSES OF INFLAMMATIONS OF THE STOMACH.—These are often the same as occasion inflammation of other organs; but there are many causes which most frequently and especially produce one or other of the forms of gastritis.

26. *A.* The *predisposing causes* of gastritis are more especially such as favour the occurrence of inflammation generally; as depression or exhaustion of organic nervous power, functional disorders of the digestive, assimilating and excreting organs; alterations of the circulating fluids, especially imperfect depuration of the blood, and vascular plethora; high ranges of temperature, in connection with a humid or malarious atmosphere; habitual excesses in food and spirituous or vinous liquors; sedentary employments, or occupations which are followed in a stooping position, mental application and the depressing emotions; the suppression of eruptions or accustomed discharges, of periodic losses of blood, or of external painful affections; convalescence from fevers or other acute maladies; sympathy with diseases of other organs or structures; and tight-lacing in females, or close cinctures, &c.

27. *B.* The *occasional exciting causes* are chiefly those which consist — 1st, of injurious ingesta; 2nd, pre-existing disease; and 3rd, mechanical agents or physical influences. — (*a*). Excesses in food or drink, beyond the usual quantity of either, or as regards the incongruous nature of the articles; irritating and indigestible food, especially dried, preserved, or long-kept animal substances; various kinds of fish, more particularly shell-fish, in certain idiosyncrasies; a too high or too low temperature of the articles taken into the stomach, especially when taken in large quantities, and in predisposed states of the frame, unnatural distension and oppletion of the stomach; the excessive use of any stimulant, particularly alcoholic liquors, tinctures, cordials, &c., of aromatics, spices, rich sauces, highly seasoned dishes, &c., or of vinous, saccharine, acid, or fermenting beverages; an inappropriate recourse to irritating emetics or purgatives, particularly in large doses, as when the former has been thus given in order to procure the expulsion of narcotic or other poisons; the ingestion of any of the numerous articles comprised in the classes of irritant, acrid and narcotico-irritant poisons (see art. POISONS); the use of various resinous, oleaginous, alkaline or acid medicines in too large or frequent doses, or of various vegetable or other concentrated principles; spoilt, putrid, or rancid or unwholesome kinds of food, or impure, stagnant, or contaminated water; rancid, fatty, or oleaginous articles; and unripe, acid, or stale vegetables or fruits.

28. (*b.*) Pre-existing disorders or diseases may run on to some form or other of gastritis, either by their increased severity, or by their extension to one or more of the tissues of the stomach. Thus, flatulence and other forms of indigestion, pyrosis, morbid appetite, or rumination, may pass into gastritis, either spontaneously, or more commonly after errors of diet or regimen, or after a recourse to injudicious remedial means, or to unwholesome or unsuitable food or drink. Biliary disorders, particularly accumulations of acrid bile in the gall-bladder or ducts, may occasion gastritis; the irruption of the bile into the duodenum, and partially into the stomach, irritating or inflaming both these viscera. Disease or severe injury of distant organs, with which the stomach is most disposed to sympathise, as the brain, kidneys, uterus, skin, &c., may not only predispose, but even excite this viscus to inflammatory action. More frequently, however, the stomach becomes implicated either by continuity of structure, or by contiguity of position. Thus inflammation of the œsophagus may extend to the stomach, or both

conceives, intimately connected with the origin and nature of a number of morbid productions. The matter contained in the cells consists of blood and fibrine or lymph. This latter substance was first observed by **Hewson**, and has been recently viewed by **Kölliker**, as the fibrinous remains of the blood-globules after dissolution in the intimate structure of the spleen. The importance of this substance in the animal œconomy was insisted on by **Tiedemann** and **Gmelin**. M. **Andral** has made no reference to the observations of these physiologists; but, to the morbid states of this coagulated matter contained in the spleen, he has chiefly ascribed, not only a number of the changes which this organ exhibits, but many also which are found in the other parts of the body. Professors **Tiedemann** and **Gmelin** had attributed important offices to this matter, conceiving that it was influential, when carried into the chyle by the absorbents, or into the circulation, in changing the chyle into blood; and they had recourse to pathological facts in support of this opinion. But M. **Andral** went still further, and conceived that "it enjoys, although not possessed of any distinct organisation, perhaps, a greater sum of vitality than the fibrous tissue which contains it, and consequently is more prone to become altered in its nutrition, and to separate from its own substance various morbid products."

77. M. **Andral** has erred in imputing to this matter endowments and powers which it is not entitled to, and which are merely changes or modifications of this matter, owing to the states of the vital energies of the frame, especially as manifested in this viscus through the medium of the nerves supplying its bloodvessels and proper tissue,—this matter itself not being the active agent in producing those changes, but the passive recipient merely of the influence exerted on it by the organic nerves supplying the organ, and undergoing changes in consequence of modified states of this influence. Besides, as I have shown above (§ 4. *et seq.*), the views of these pathologists have been disputed in the more recent researches of **Kölliker**, who has inferred, if he has not fully proved, that the spleen does not discharge the function which they have imputed to this organ, but, on the contrary, a very opposite one,—that it produces a solution of the blood-globules, depriving them of their colouring matter, and preventing the excessive abundance of coloured globules in the blood, which might otherwise occur.

78. i. **The Causes** of organic lesions of the spleen are, chiefly and more remotely, those already mentioned (§ 14. *et seq.*); but there are others which more immediately and directly induce these lesions, and which consist of previous disease—of one or other of the affections already mentioned, or even of a combination of them—1st, of inflammatory action in some one of its grades, affecting chiefly the fibrous and muscular tissues of the organ; 2nd, of remarkable impairment of vital power and of organic cohesion; 3rd, of morbid states of the blood contained in, or circulating through, the viscus; and 4th, of various combinations of the preceding conditions. During the influence of depressing causes, moral or physical, the spleen often experiences a deficiency of vital contractile power; and it hence soon becomes turgescent, or inflamed if the causes commonly productive of inflammation are in operation, and very soon afterwards engorged and enlarged, or otherwise structurally altered. When the incipient symptoms are inflammatory, this state soon passes into organic change; and it is generally impossible to ascertain during life when the former terminates and the latter begins; the one passing insensibly into the other. With these successive changes, the blood-globules become more and more altered or dissolved, and the fibrine in the blood, or the corpuscles constituting fibrine, more abundant. During the changes of the blood, caused either by agents acting primarily on this fluid, or by disorders of depurating organs, the spleen also early and manifestly undergoes important alterations, for, not only is it more or less congested or enlarged, but its vital cohesion is also remarkably impaired, as shown by its state after death from malignant or adynamic maladies. Many of its organic changes, especially those which are chronic, may be imputed to the frequent occurrence of congestion, or of acute, sub-acute or chronic inflammatory action, or to the absorption of morbid matter, or to the accumulation of injurious elements, owing to impaired excretion.

79. ii. **Alterations of the Fibrous Structure of the Spleen.**—*A. Lesions of the Capsule of the Viscus.*—These consist—1st, Of an unusual injection and congestion of its bloodvessels; 2nd, Of softening, in various grades, which may even be so great as to occasion its rupture; 3rd, Of its thickening, either with or without some degree of induration; 4th, Of its transformation into fibro-cartilaginous, cartilaginous, or even osseous substances. These changes are independent of, although very frequently connected with, similar alterations in the peritoneal envelope of the organ, and more especially with inflammatory changes, as effusions of lymph and serum, false membranes on the free surface, or thickening of the peritoneal covering, adhesions to adjoining organs or parts, &c.

80. *B. Alterations of the Trabecular or Fibro-Muscular Tissues and Parietes of the Splenic Cells.*—These are but imperfectly known. This part of the fibrous structure of the organ has been found, however, 1st, in a state of softening; 2nd, in a state of enlargement, rendering the septa thicker and more apparent than natural; 3rd, partially changed, in rare cases, into a cartilaginous or osseous substance. From this it will be perceived, that the changes of the internal fibrous structure of the spleen are nearly the same as those of its capsule. In respect of injection of the vessels ramified to it, and other inflammatory appearances, it may be remarked they cannot be so readily recognised in the internal, as in the external fibrous structure of the viscus.

81. iii. **Lesions of the Spleen seated in both its containing and contained parts.**—The alterations observed in the coagulated matter contained in the cells of the spleen evidently result from a change in the vital conditions of the organ, by which the internal arrangement of the particles composing this matter is modified. The only question here is, whether this modification takes place subsequently to the formation of this matter, or at the moment of its secretion? Most probably this modification results from the influence excited by the nerves upon the vessels producing this matter, and is not the remote

consequence of changes experienced by it subsequently.

82. *A. Altered consistence of the spleen* is a very frequent occurrence, and seems to depend upon—1st, the state of its fibrous structure; and 2nd, upon changes in the consistence of the coagulated matter and blood contained in its cells and capillaries. M. ANDRAL refers alterations in its consistence, as well as other lesions of this organ about to be considered, to the state of the blood which fills the splenic cells and capillaries. This is substituting the effect for the cause, although, doubtless, a dissolved state of the blood which the spleen contains will materially diminish its natural firmness. It is much more likely that changes of this kind, as well as the greater number of the lesions of this viscus, depend more upon the state of its organic nervous influence, and upon the vital cohesion of its fibrous structure, than upon the condition of the blood contained in its cells. It may be allowed that the coagulated matter and the blood contained in the spleen experience important changes; but these are surely not primary, but the effects of that influence to which I have now referred them. This view of the subject is supported by the physiological researches of HOME, TIEDEMANN, GMELIN, SCHMIDT, PROUT, and BÉCLARD; and by the experiments of M. DEFERMON.

83. *a. Softening of the spleen* is a very frequent lesion; particularly in fevers. In this state the natural cohesion of the capsule and of the fibrous and muscular septa is diminished, and the coagulating matter and the blood contained in the cells, pulp, and capillaries of the viscus, have lost their natural crasis, so that they are readily washed out, leaving the fibrous structure entire. In some cases, the blood and the coagulating matter formed in the spleen are quite fluid, and the internal structure of the viscus so weakened and injured, generally from its diminished cohesion and great distension, that an indistinct sense of fluctuation is given upon examining the viscus externally. The spleen, when softened, is seldom diminished in size; it is generally either enlarged, sometimes greatly, or it preserves its natural volume. Softening with enlargement of this viscus is one of the most frequent lesions occasioned by adynamic or malignant fevers.

84. *b. Increased firmness or induration* of the spleen seems to result from augmented cohesion of the fibrous structure of the spleen and blood-vessels, or from a modified state of the coagulating matter contained in the cells of the viscus. In many cases of this description, the blood seems particularly dense, and together with the coagulated matter, gives to the spleen, when divided, the appearance of a slice of the liver. When the increased firmness of the organ amounts to *induration*, the change may be attributed partly to a cartilaginous degeneration of portions of the fibrous structure, to thickening or hypertrophy of this structure consequent upon protracted inflammatory irritation, and partly to the formation of an organised or partially organised lymph, or to a fibrinous deposit in the parenchyma of the viscus. Increased firmness or induration is frequently associated with alterations of size, especially *enlargement*. *Alterations of the size* of the spleen are chiefly referable to the same causes as changes its consistence, viz. to the vital cohesion of its structures, and of the blood and coagulated matte contained in it, and to the action of its differen vessels.

85. iv. ENLARGEMENTS OR TUMOURS OF THE SPLEEN may proceed — 1st, from the diminished cohesion and yielding state of the fibrous substance; 2nd, from diminished action of the veins and lymphatics; 3rd, from a greater quantity of blood being accumulated in the capillaries and cells than is carried out by the veins; and 4th, from a greater quantity of the coagulated matter being formed in, than is removed from, this organ. It is evident that the effect in question seldom proceeds from one only of the above causes, but generally depends, more or less, upon two or even a greater number of them.

86. *A.* When the spleen is much enlarged, it often ascends in the left hypochondrium, thrusts the diaphragm upwards, and, becoming more closely applied to the surface of the ribs, occasions as dull a sound on percussion as is heard in the right hypochondrium from the presence of the liver. Sometimes the enlarged spleen, pressing thus upwards, does not project beneath the margins of the ribs. In this case its enlargement can only be determined by percussion and auscultation. But more commonly it descends below the margins of the left ribs, occasioning a tumour, varying in dimensions and form. This tumour occupies the left hypochondrium, and may be so large as to extend to the left flank, to the epigastrium, and to the umbilical region. In some cases I have seen it so much enlarged as to extend to the right side of the abdomen. It should, however, be recollected that the spleen may form a tumour below the ribs without being materially enlarged, owing to the diaphragm being pressed downwards by an effusion of fluid into the pleural cavity. Instances of excessive enlargement of the spleen, with or without induration or increased firmness, have been recorded by authors. COLUMBUS and SCHENCK record cases in which the viscus weighed twenty pounds, the fibrous envelope being nearly cartilaginous. BURROWES saw one which weighed twelve pounds, and J. P. FRANK one that was sixteen pounds weight. The more chronic cases of enlargement are frequently attended by some degree of induration; whilst the more rapidly formed instances of enlargement, as frequently observed in the more pestilential or miasmal climates, are characterised by more or less softening or friability of the viscus.

87. *B. Chronic tumours or enlargements of the spleen* — vulgarly *ague-cakes* — are very different from the enlargements of the viscus which take place from *vascular congestion* (§ 22. *et seq.*), and which occur not infrequently in the course, or as a sequela of adynamic or exanthematic fevers, or other diseases. These tumours differ in character, and are owing partly to hyperæmia, partly to the deposition of the anomalous fibrous product already noticed in the parenchyma of the spleen. The consistence of the organ varies greatly. The tumour or enlargement is most probably at first soft, but becomes harder, according as the deposit is more coagulable, and as the more fluid parts are absorbed. The colour of the swollen or enlarged viscus is probably at first reddish, but becomes paler as the colouring matter is absorbed, and as increased vascularity yields, and gives place to the fibrous deposit.

88. *C. Diminished volume* of the spleen sometimes occurs, but much less frequently than increase of its size. Occasionally it is very much diminished. M. Andral has seen it no larger than a walnut. In cases of this description, the consistence of its fibrous structure, and of the contents of its cells, may be either increased or diminished. With the causes of atrophy of the spleen, and of the particular circumstances connected with it, we are altogether unacquainted.

89. *D. The colour* of the spleen is occasionally considerably changed. In some cases it is of a bright red, deepening through all the shades to a blackish hue. When this occurs in spots only, the organ presents a speckled appearance. It sometimes also assumes, in certain portions, a whitish or yellowish tint; these portions either retaining the same consistence as the rest of the organ, or being harder or softer than it. It is difficult to say whether this change of colour depends more upon diminished vascularity of the fibrous structure of the part thus affected, or on change of the colour and consistence of the coagulated matter and blood contained in the parenchyma and cells of the viscus. M. Andral imputes it entirely to the latter cause, and thinks it does not result from the formation of any new production.

90. v. Morbid Formations.—1st, *Purulent matter* is sometimes found in the spleen, either in isolated drops disseminated through its parenchyma, or in abscesses of various dimensions. These latter may here, as in the liver, be separated from the surrounding parts by a false membrane or cyst, or may be in immediate contact with, or pass insensibly into, the sound parts. Abscesses devoid of any cyst sometimes acquire a large size, occupying the greater part of the internal structure of the viscus. In these cases, the surrounding parenchyma is generally soft, pulpy, and readily breaks down notwithstanding the utmost care. In the parts most distant from the collected matter, the capsule and fibrous tissue generally remain unchanged; but when the capsule comes in contact with the purulent matter, it also loses its vital cohesion, and allows the collected matter to find its way through it, either into the peritoneal cavity, or, having formed adhesions to adjoining viscera, into them. Abscesses of the spleen may thus burst into the stomach, the colon, the thorax, and even into the urinary passages. Cases have also been described, wherein they have found their way, externally through either the anterior abdominal parietes, or the back, or even the loins; but such occurrences are extremely rare.

91. Infiltration of purulent matter into the parenchyma of the spleen, as well as its collection in distinct abscesses, may coexist with similar depositions in other parenchymatous organs. Thus pus has been found in the spleen, liver and lungs, and even in the brain also, of the same subject. It is sometimes found in one or more of these organs and in the cavities of the joints in the same case. In all these cases the pus is formed in some other part, as in the veins, in the sinuses and cavity of the uterus, &c., whence it passes into the current of the circulation, and is either deposited in these situations, or occasions an inflammatory state of these parts, rapidly followed by the suppurating process. For reasons assigned in another place (see arts. Absorption, Abscess, *symptomatic*, and Veins, *diseases of*), I believe that the latter more commonly obtains. In some instances, as in phlebitis, metritis, &c., purulent matter is formed in the part primarily affected, and subsequently appears in the spleen only; but more generally it is also found in some other situations at the same time. The majority of instances, in which purulent matter is found in the spleen, are of the above description. Those instances in which the pus has proceeded from inflammation, acute, sub-acute or chronic, originally affecting the substance of this viscus, are not common, unless as a complication of remittent and intermittent fevers; but in these cases of primary formation of matter in the spleen, according to my experience, a distinct abscess or abscesses are found, and rarely infiltration only, this latter being always a consecutive deposition or formation.

92. 2nd. *Tubercular matter* is not infrequently found in the parenchyma of the spleen, generally in the form of minute grains, either isolated or clustered together. Tubercles of this organ are much more common in children than in adults; but they seldom are found in it, at any age, unless they exist in other organs at the same time. Tubercles are very common in the spleen of the lower animals.

93. 3rd. *Cysts*, of various kinds, are occasionally found in this organ. Their simplest form is that of small vesicles filled with a serous fluid, existing either singly or in clusters. These vesicles are sometimes found in great numbers. M. Andral states, that they are not confined to the splenic cells, he having found them within the splenic veins, some floating loose, others attached by peduncles to the sides of the veins, and others again lodged between their coats. He has also observed cysts of a much more complicated structure in the spleen: these consist of a serous, or sero-fibrous tissue, containing either a honey-like matter, or a substance resembling suet, interspersed with hairs. *Hydatidic* cysts are sometimes found in the spleen, but not so frequently as in the liver. Their mode of development in the former is in every respect the same as in the latter (see art. Liver, § 232.).

94. As to *the origin* of the above formations much difference of opinion exists. M. Andral supposes that they are nothing else than the blood contained in the splenic cells modified in its qualities. "The experiments of M. Gendrin," he observes, "seem to prove that the blood may be converted into pus. The result of my own observations has convinced me that, by a simple alteration of its colour and consistence, it may be converted into a substance perfectly analogous to the encephaloid tissue described by Laennec. Let us go a little further, and suppose the blood in small circumscribed masses deprived of its colour, and diminished in its consistence, so as to become curdy and friable, and we have then all the essential characters of tubercles." (*Anat. Path.*).

95. The changes which M. Andral supposes to commence in the blood contained in the spleen should rather be referred to an alteration of the coagulated matter or lymph formed by the vessels ramified on the parietes of the splenic cells; both because the morbid deposit is more immediately produced by the vital action of this viscus and of its vessels, and is not a fluid circulating merely

through it, and there arrested in its course; and because the morbid productions to which this author has referred, particularly tubercles and encephaloid tissue, have closer points of similarity to this particular coagulated matter than to the blood itself. Besides, we have no proofs that blood ever undergoes changes, similar to those for which M. ANDRAL contends, from being contained in, or circulating through, the capillaries or cells of an erectile tissue. Whatever changes the splenic blood may undergo, must result either from the state of organic nervous or vital influence, with which the spleen is endowed, or from the condition of the blood circulating in it, or from the properties of the coagulated matter which it is engaged in forming, supposing that this matter mixes with the blood taken up by the splenic veins. These causes may combine to produce the ultimate effect; but the first should be viewed as primarily and chiefly influential, and the latter as early results, inducing further effects.

96. The *proximate causes* of the foregoing lesions of the spleen may depend—1st, upon irritation in various grades up to acute inflammation; such as increased vascularity, induration, ossific change, primary formation of matter, &c.; 2nd, on a diminution of the nervous and vital influence of the organ, affecting the action of its vessels and its functions, and the state of the blood contained in the capillaries of its proper structure and cells—as softening, changes of colour, congestion, enlargement, &c.; 3rd, on obstructed return of blood through the veins, as from organic disease of the liver or of the heart, especially congestion, enlargement, induration, &c.; 4th, on a tendency existing in the system to the formation of the matters found in the spleen — as pus, tubercles, cancerous matter, cysts, &c. This tendency may depend on the local or general states of vital influence; or the substance found in the spleen may be conveyed through the channel of the circulation, and deposited or secreted in this situation. It is possible also that both these may co-exist.

97. vi. HÆMORRHAGE IN THE SPLEEN.—*Apoplexy of the spleen*, CRUVEILHIER. — This able pathologist has described the hæmorrhages sometimes met with in the substance of the spleen, especially in the course of intermittent fevers. Hæmorrhagic deposits of various sizes, rounded in form, and exhibiting all the changes which the blood undergoes in apoplexy of the brain or other organs, are the appearances usually presented in cases of splenic apoplexy. Ochry-brown cicatrices and fibrous cysts of the same colour, observed in rarer instances, may be viewed as the remains of former hæmorrhages, with breach of substance. Hæmorrhagic effusion into the parenchyma of this viscus should not be confounded with pulpy softening of this viscus, from which it is altogether distinct. M. CRUVEILHIER remarks, that, at every strong muscular effort, the blood rushes into the structure of the spleen, distending it, and thereby causing rupture. What renders this opinion the more probable is the frequency of hæmorrhage in the spleen of the horse. M. BAILLY has also adduced cases of spontaneous hæmorrhage into the substance of the spleen from ague.

98. vii. The DIAGNOSIS of organic diseases of the spleen is extremely difficult as regards certain of them, and very easy as respects others. Enlargement and induration of this viscus are readily recognised, unless they be slight or incipient. The existence of *abscess* of the spleen is to be inferred from the history of the case and the symptoms mentioned above—especially when the acute disease has passed the sixteenth day, the viscus increasing in size,—if fever be exasperated towards night, with increased heat in the soles of the feet and palms of the hands, — if rigors appear, followed by flushes, perspirations, and a soft pulse, — and if the complexion become more pallid, leaden, or sallow, and the bowels more relaxed. The existence of the other organic lesions of the spleen is often not manifested during life, and can very rarely be inferred with the least precision, either from the history of the case or from the symptoms complained of. Pulpy softening, however, when accompanied with more or less tumefaction, may be suspected from the softness and tenderness of the swelling and the antecedents of the case, but the examination ought always in such instances to be conducted with gentleness and care; for the spleen may be ruptured during life by a rough examination, especially in the advanced stage of remittent fever, during which this state of the spleen chiefly occurs.

99. viii. The PROGNOSIS of structural changes of the spleen entirely depends upon the nature of these changes, many of which cannot be ascertained during life. The existence of *abscess* is always dangerous, but not always fatal, as recovery may take place in the manner already mentioned. *Enlargements* of the viscus are always serious maladies; but, when they are not excessive, are not associated with obstructed liver or disease of the heart, are not accompanied with a boggy or pulpy feel upon examination, or extreme hardness, they may either be removed, or the patient may live some years without change in the tumour or in his general state. If the enlargement be pulpy or boggy, if it be attended by much tenderness or pain, or by extreme hardness, or accompanied with protracted diarrhœa, or with exhausting hæmorrhages from either the stomach or bowels, or with disease in the liver or other organs, or with abdominal dropsy, the prognosis should be very unfavourable. In all cases of inferred alteration of the spleen, the constitutional symptoms and the complications should guide the prognosis, especially the apparent amount of vital power, of vascular fulness, or of anæmia, and the connection existing between it and diseases of other organs.

100. ix. The TREATMENT of structural diseases of the spleen has been in great measure stated when noticing the treatment of chronic splenitis. The chief and most common changes of this viscus, which come under the care of the physician, are *enlargement* and *induration*, and these are the usual consequences either of acute, sub-acute or chronitic splenitis, or of repeated attacks of congestion, caused by obstinate agues, especially in miasmal localities. After having recourse to purgatives, in the combinations already mentioned, more especially with sulphate of quina, sulphate of iron, &c. (§ 60. *et seq.*), and to liniments and embrocations applied over the splenic region, these morbid conditions generally disappear; but, if they still continue, the *iodide of potassium* may be prescribed in connection with such other means as

matters consisting of such as have been more recently taken, or of a glairy fluid with mucus. Instead of pain, a sense of gnawing, of craving, or of sinking, is sometimes experienced; and either of these may be accompanied with flatulent or acrid eructations, with fulness or tension at the epigastrium, or with a feeling of distension, or of heat, and general discomfort. The appetite is either altogether lost, or it is craving, gnawing and morbid, articles which are most inappropriate being desired. These articles generally aggravate the pain, or occasion vomiting, and increase the thirst, which is generally present. A foul or loaded, or furred tongue, the point and edges being red, or indented by the teeth; an unpleasant taste in the mouth, or a vitiated taste; heartburn, or a sense of acidity of the stomach, with frequent acrid, acid, fœtid or rancid eructations; costiveness, or an irregular state of the bowels, the stools being often deficient in bile, or of a very dark bilious appearance, and offensive, are generally experienced. The urine is either scanty, clear and high-coloured, or paler, turbid, or phosphatic. Chilliness and feverishness, frequently with frontal headache; a dry, harsh or scaly state of the skin; general mal-aise, want of physical power, and defective mental energy and application, are commonly complained of.

50. With the continuance of the complaint, numerous sympathetic feelings and disorders are manifested. The several senses are often slightly affected. The mind is always engaged with the bodily feelings, which become exacerbated, or are exaggerated by the constant attention directed to them; the disorder often approaching the characters of hypochondriasis, or even passing into this complaint. The temper is irritable and uncertain. In many cases, the pharynx and fauces present a similar state of chronic irritation, with congestion or inflammation, as may be presumed to be present in the stomach, and the irritation sometimes extends to the epiglottis or larynx, and is perpetuated by the acrid eructations which occur. In these cases, a dry stomachic cough is complained of, a fit of which sometimes is followed by retching or even vomiting. Palpitations, with increased frequency or irregularity of the pulse, are often experienced. Occasionally the tongue presents patches as if deprived of its epithelium in parts. It is generally loaded or furred at its base, and the follicles swollen. Sometimes the surface is red, smooth and shining throughout; or it is variously fissured. The gums are swollen or spongy, and fall or recede from the teeth. According to the severity and duration of the disease, numerous other sympathetic affections are developed, continue for a time and disappear, or become permanent. The disease thus proceeds for an indefinite time, and is either ultimately relieved or removed, or it exhausts and emaciates the patient, and superinduces organic lesions of the stomach, especially at the cardia or pylorus, or disease of the liver, lungs, pancreas, or kidneys; the complication often terminating life.

51. ii. APPEARANCES ON DISSECTION. — The changes produced by the milder forms of gastritis —by the mild and sub-acute—are rarely observed unless when they occur at an advanced stage of some chronic disease, as tubercular consumption, hectic fever, &c. These changes, as well as those which are produced by acute gastritis, have been very fully described when treating of the morbid anatomy of the alimentary canal (see art. DIGESTIVE CANAL, § 21. *et seq.*), and of the effects of POISONS, under which head the alterations produced by the several corrosive, irritating and other poisons in the stomach are circumstantially detailed. In the more sub-acute and chronic states of gastritis, especially as observed in drunkards, or in persons addicted to excesses in eating, are chiefly a dark, reddish-brown, or slate-grey, or blackish blue discolouration of the villous membrane, thickening, increased condensation or induration of this membrane — an hypertrophy, presenting itself in various grades (see art. DIGESTIVE CANAL, § 27. *et seq.*). The pyloric portion of the stomach is generally the chief seat of the more chronic inflammation of the stomach, the sub-mucous cellular tissue, and the muscular coat, participating in the hypertrophy, in various degrees, the parietes of the viscus chiefly in and near this portion presenting increased thickness and hardness. In some of these cases, the stomach contains or presents on its internal surface, a greyish, or colourless, glairy mucous secretion, in considerable quantity. In cases of acute gastritis complicating exanthematic fevers, or caused by some kinds of poisons, flocculent exudations, or even partial formations of false membrane, are sometimes found on the mucous surface.

52. Idiopathic inflammation of the internal coats of the stomach, involving chiefly the submucous and connecting cellular tissue, and terminating in suppuration, is very seldom observed. Inflammations thus seated and thus terminating are oftener met with consecutively of, or associated with, some other malady. In these cases, the parietes of the stomach are thickened, owing to the sub-mucous tissue being distended with pus; this tissue being softened and friable. The mucous membrane itself is generally injected and red. In some parts, this membrane is perforated by numerous irregular cribriform openings, through which the pus escapes into the cavity of the stomach. The various organic lesions of the stomach consequent upon gastritis, or upon constitutional or other causes, are fully described under the head DIGESTIVE CANAL (§ 18. *et seq.*), and, as respects their symptoms and treatment, are considered in the sequel.

53. iii. DIAGNOSIS OF GASTRITIS.— *Peritonitis*, especially when circumscribed or limited to the viscera or regions of the upper part of the abdomen, may be mistaken for gastritis, as the prostation, pain, vomitings, retchings, &c., may be as great in the one as in the other. But the situation of the pain, the great tenderness, especially at the epigastrium, the sense of burning there, the character of the thirst and desire of cold or iced fluids; the mucous and glairy or ropy matters vomited, sometimes streaked with blood, the appearance of the tongue, and the not infrequent recognition of the exciting cause, generally indicate the nature of the malady. When gastritis is consequent upon hepatitis, or splenitis, or omentitis, or diaphragmitis, as sometimes observed, especially upon the first of these, the diagnosis may be more difficult. But the history of the case, and the appearance of severe gastritic symptoms during the course of hepatic disease, or of the other inflammations, will indicate this extension of the morbid action. When more general perito-

nitis is present, the diagnosis is more manifest; inasmuch as the painful symptoms extend much lower, whilst in gastritis they ascend to the base of the thorax, and are generally attended by a greater amount of anxiety extending frequently to the præcordia. When inflammation affects the opposing peritoneal surfaces of stomach and liver, as not infrequently found after death, especially in warm climates, the symptoms are often equivocal in respect of either organ. The complication may, however, be inferred from the characters of the early symptoms, and of those more recently developed.

54. The diagnosis of the milder and more chronic states of gastritis, is much more difficult than that of the acute. The not infrequent temporary relief of pain and other symptoms of the former, by stimulants and carminatives, frequently suggests the existence merely of indigestion or morbid sensibility of the organ, whereas a mild or chronic state of inflammation of the mucous surface may exist nevertheless. But, when pain is present in the region of the stomach, and is increased by pressure, or by food, and by warm fluids; when vomiting of a ropy and abundant mucus takes place; and when the throat, fauces and gums are red or inflamed, this form of gastritis may be truly inferred. The aggravation of pain, or the production of vomiting, by warm tea, or other warm fluids; a dry and scaly state of the skin; the presence of papular or other eruptions on the skin; the relief following the use of cooling fluids, and an abstemious or low diet; the spongy or inflamed gums; the red papillated, aphthous, or fissured states of the tongue; or a dry, red, or smooth and shining appearance of this organ; and heat in the palms of the hands, or soles of the feet, are severally indications of mild or chronic gastritis, especially when observed in connection with slight febrile symptoms, and an alteration in the secretions and excretions.

55. iv. The Prognosis in the milder forms of gastritis, and even in the chronic states, before serious complications have been developed, is generally more or less favourable, provided that a judicious treatment, especially in respect of diet, regimen and air be adopted and persevered in. When, however, organic disease of some vital or important organ has either preceded, or been developed in the course of, these states of gastritis, a very unfavourable issue may be anticipated, or may be near at hand; mild, sub-acute, or chronic gastritis, or gastro-enteritis, or even gastro-œsophagitis, with troublesome irritation of the pharynx or fauces, very commonly characterising the far advanced stage of hectic and organic visceral diseases.

56. In acute gastritis, the prognosis depends much upon the exciting cause. When this is of a very corrosive or acrid nature; when it has not been entirely removed from the stomach, and when this viscus was empty when it was taken; when the injurious matter is not only acrid or irritant, but also depressing to the organic nervous energy, a very unfavourable issue may be expected, even at an early period of the disease. If, however, the cause be altogether removed, and a diminution of the sufferings, or of the vomiting be remarked; and if appropriate means be retained on the stomach — if the painful symptoms abate, and none of the most dangerous appear — if the matters vomited be neither streaked with blood nor sanious—if neither singultus, or cold perspirations be present — if the anxiety, distress and restlessness be relieved — if the character of the pulse, respiration, and of the sympathetic disturbance improve; and if the disease be primary or uncomplicated, a favourable issue may reasonably be expected, if no error in diet or regimen be committed, so as to increase or to rekindle the inflammatory action. When acute gastritis appears in the course of exanthematous or other fevers; or when it is consecutive of hepatitis, or of inflammation of one or other of the adjoining viscera, the prognosis should be extremely guarded, for the extension and complication of disease may be attended by great danger, although the symptoms may not appear very severe. In these cases especially, the extent and exact seat of lesion are not easily determined, the degree of prostration, the character of the pulse, the state of the abdominal surface and of the extremities, the anxiety and appearance of the countenance, the position of the patient, and the nature of the retchings and matters vomited, severally guiding the prognosis.

57. v. Treatment.—The treatment of the several forms of gastritis should be conducted with the same intentions for each; — namely, 1st, to remove the exciting cause; 2ndly, to subdue the inflammatory action produced; 3rdly, to avoid whatever may irritate or excite the stomach by its properties, or the quantity taken; and, 4thly, to restore the healthy functions of the organ.—*A. The milder forms of gastritis* are generally caused by errors of regimen, especially in respect of food and drink, and, in many cases, they require merely abstinence, or a mild, farinaceous, and abstemious diet for their removal. But, in some constitutions, and in others where abstemiousness is not observed, the complaint, although mild at first, becomes either chronic or exasperated, and, in addition to a strict regimen, various other means are required. These means should be suited to the age, constitution, and power of the patient, and the severity of the disease. Generally, the application of leeches over the epigastrium, followed by rubefacients, especially the terebinthinate embrocation, and the administration of emollients, with refrigerants, &c. are sufficient to remove the milder states of disorder. Small doses of the nitrate of potass, given in the mistura amygdalæ, with hydrocyanic acid, are usually of service. The bowels should be kept freely open by means of cathartic enemata. A moderate dose of calomel may be given at bed-time, early in the disease, especially when the functions of the liver are impaired; and its operation may be increased by about twenty or thirty grains of calcined magnesia in the morning, followed by a glass of lemonade immediately after the magnesia is taken; or a drachm of citrate of magnesia may be prescribed in any mild vehicle. Even when retching or vomiting is present, the above means usually afford relief in a short time; especially when the *third* indication is duly enforced, and abstinence is observed, the mildest farinaceous articles only being taken in small quantity.

58. *B.* In the more *acute* or *severe cases* of gastritis, the removal of the exciting cause should be instantly attempted; and if this be of a poisonous nature, the means advised for this purpose

in the article Poisons ought to be employed. Vascular depletion should be promptly ordered, the amount being regulated by the age and strength of the patient, by the state of the pulse, and more especially by the nature of the exciting cause. In most acute cases, and at an early period, one general *bloodletting*, which may be followed by the application of leeches to the epigastrium, or by a repetition of the local bleeding, and by a blister, or a rubefacient embrocation or epithem, is requisite. In some cases, especially when the disease is not occasioned by poison, a full dose of calomel, at an early period, is of much service, and tends remarkably, especially when given with magnesia in the form of powder, to allay the irritability of the stomach: but medicines should be sparingly given by the mouth, those already mentioned (§ 57.) being the most appropriate. When the vomiting is urgent, and the sense of heat at the stomach great, the nitrate of potash may be given, as above combined, more frequently, and two or three drops of tinctura opii may be added to each dose. But the quantity of the vehicle should be small and emollient or mucilaginous, and effervescing mixtures or large draughts avoided. Small morsels of ice, and the citrate of ammonia, or of soda, or of magnesia, in weak solution and in small quantity, are generally beneficial, the latter especially when the bowels are not sufficiently open.

59. At an advanced stage of acute gastritis, when vomiting is almost constant and without much effort, or when blood is brought up with other matters, or when the pulse is sinking or irregular, it becomes a question what means should be adopted, or whether any can be of service. In these almost hopeless circumstances, where fatal disorganization of the stomach is expected, I have sometimes prescribed the spirits of turpentine by the mouth, in small and repeated doses, in the form of an electuary with aromatics (see art. Spleen, § 69.), and a turpentine epithem to be applied at the same time over the epigastrium and abdomen. In many instances, such doses of tinctura opii as the peculiarities of the case may suggest, and very small doses of creasote, may be added to the electuary. (*See Author on the Use of Terebinthinate Remedies in Disease; in Lond. Medical and Physical Journal for* 1821.) In several instances, when this treatment has been prescribed in these circumstances, the vomiting has ceased almost immediately, and the patient has ultimately recovered.

60. *C. The chronic states of gastritis* require means which their antecedents and causes chiefly should suggest. In some cases, especially when indications of exacerbation from errors in regimen present themselves, leeches applied on the epigastrium are necessary, and the repetition of them, after various intervals, should not be overlooked. Generally, a few leeches, and a frequent repetition of them, are more beneficial than a great number applied at one time. After these, warm embrocations, rubefacient plasters, or even blisters, are of service. But in most of the chronic states of the disease, whether simple or complicated, diet and regimen should receive the strictest attention. In some instances, the mild preparations of mercury suitably combined with gentle laxatives or aperients, are of great service, and when the liver is torpid, they can hardly be dispensed with. When chronic gastritis is complicated with enlargement of the liver, calomel, or other mild mercurials, conjoined or alternated with purgatives, and aided by the deobstruents advised for this state of the liver (see Liver, § 245. *et seq.*), should not be omitted.

61. *D.* In most cases, when *pain* or *spasm* is referred to the stomach in the course of this state of disease, hydrocyanic acid, in mucilaginous or emollient mixtures, or with a weak solution of any of the alkaline carbonates, or with limewater and milk, is generally productive of benefit. In these cases, also, the nitrate of bismuth, or the oxide or nitrate of silver, combined with very small doses of ipecacuanha (from the sixth to the quarter of a grain), and opium or henbane, is of great service. The oxide or the sulphate of zinc, in small doses, is also very beneficial, when combined with anodynes. Dr. Wood remarks, respecting the nitrate of silver, that from a quarter of a grain to a grain is often administered two or three times a day with advantage. Cures in most obstinate cases have been obtained from this substance. It has appeared to be most serviceable in those cases which are attended by vomiting, and in which the tongue is smooth and glossy, as if deprived of the papillary structure. I have, for many years, been in the habit of prescribing the nitrate intimately triturated with narcotics in these cases, and in the chronic states of gastritis complicated with palpitation, or with irritation of the intestinal mucous membrane.

62. When convalescence commences and advances, the mild vegetable tonics, especially the infusion of calumba or of cheireita; subsequently the chalybeate preparations; and the diet, regimen, and mineral springs, or artificial mineral waters, advised when treating of Indigestion and Hypochondriasis, should be resorted to, according to the circumstances of each case. In most instances, travelling, change of air and of scene, gentle but agreeable mental occupation, relaxation from the anxieties and mental tension of continued application to business, moderate exercise in the open air, and diversion of the mind from such feelings and slight dyspeptic disorders as generally attend convalescence from gastritis, are generally most beneficial, and always requisite for a very considerable period after inflammatory affections of the stomach.

III. Organic Lesions of the Stomach.
Classif. — IV. Class. I. Order (*Author in Preface*).

63. *Alterations of structure* seated in the stomach are frequently the consequences of inflammation; but they may, in other cases, result from chronic irritation, and, in different circumstances, from vital depression, or from constitutional taint. Cancerous lesions proceed chiefly from this last cause, aided probably, or at least in some instances, by prolonged irritation, or by impaired vital power. Organic lesions of the stomach may thus be viewed as the more or less remote results of *Indigestion*, of *Hypochondriasis*, of *Morbid Appetite*, of *Pyrosis*, and of the *Nervous*, *Spasmodic* and *Inflammatory affections* now passed in review. Consequently, the Causes of these organic changes are those which are productive of the primary affections from which they spring.

64. The *Stomach* is liable in a very marked, and

in a very special manner, to all the lesions which I have fully described when treating of the *structural alterations* of the Digestive Canal. To that article I must refer the reader, for a general description of the lesions implicating the stomach; but some of those are so frequently seated in this viscus, or in its cardiac and pyloric orifices, and occasion special forms of suffering, as to require particular consideration at this place. Of these lesions the most important are, *ulceration* and *perforation*, *softening* and *disorganisation*, *thickening*, *scirrhous degeneration*, and *carcinoma*, of the parietes or of the orifices of the stomach.

65. i. Ulceration and Perforation of the Stomach. —*A.* Ulceration is very rarely an acute disease when seated in the stomach, and it is generally single, or very seldom consisting of more than one, unless when seated in the follicles. The *form* of the ulcer is usually round or oval, but it is sometimes irregular, rarely linear. It may exist in any part of the viscus. Its *margin* is either greyish, pale red, or of a deep brown, and of natural thickness and consistence, or softer, thinner, harder, or thicker than natural. In some cases the surrounding subvillous tissue is thickened and indurated. The *bottom* of the ulcer consists of different tissues, according to the depth the ulceration may have penetrated. In some instances, it is so slight, as to appear as an abrasion; more frequently, however, the villous coat is penetrated, and in some the submucous, the muscular, and even the peritoneal coats, are successively penetrated. When this last tunic is reached, as well as previously to this stage, various appearances and changes are developed which are fully described under the head Digestive Canal (§ 37. *et seq.*). The ulceration may thus proceed to perforation, without or with adhesion of the opposite surfaces of the peritoneum, around the seat of perforation. In anæmied or cachectic persons, and not infrequently in chlorotic or anæmied females, adhesions are not often formed, and the ulceration proceeds, without manifest signs of inflammation or increased vascularity, and the coats are corroded, as in phagedenic ulceration, until the peritoneal lining is either softened, or ruptured from distension of the stomach, or during an attack of vomiting following a meal, and a portion of the contents of the viscus passes into the peritoneal cavity, causing peritonitis and death in a short time. The ulcer in many of the cases presents the appearance as if the ulcerated portion were punched or stamped out of the gastric parietes, the margins often presenting no further changes than slight discolouration or injection sometimes with thickening of the cellular issue.

66. The ulceration may be *cicatrised*, as shown in the article just now referred to (§ 39.), or it may proceed onwards, after adhesions have been formed between the opposite portions of the peritoneal membrane, and thus the ulceration may proceed not only to perforation of the stomach, but also to perforation of a contiguous portion of the digestive canal, as the colon, or to more or less ulceration or perforation of another organ. In a female under my care during two or three years for severe dyspepsia, with recurring attacks of chronic gastritis, attended by vomiting, the paroxysm of vomiting being ultimately accompanied with discharges of blood, and the patient having been carried off by a violent attack of hæmatemesis, a large and deep ulceration was found in the stomach, which passed far into the substance of the liver, the peritoneal surfaces being firmly agglutinated around the perforation, and several of the vessels of the liver eroded. Where the bottom of the ulcer thus becomes agglutinated to an adjoining viscus, the contents of the stomach are thereby prevented from passing into the peritoneal cavity.

67. Of the various modes in which ulceration may take place, and of the consequences of this lesion, I cannot add anything to what I have minutely stated elsewhere (see Digestive Canal, §§ 37—44.). I may, however, briefly remark, that, although usually commencing in the villous surface, ulceration and perforation may originate in a different situation, and proceed in an opposite direction, as when an abscess in the liver, or in the spleen, opens into the stomach, by the adhesions and perforations produced by the purulent collection. But there is even a *third* mode, not hitherto described, in which atheromatous or fatty deposits in the coats of an artery favour rupture of, or exudation of blood from, the diseased portion of vessel, whereby the villous coat is perforated or torn, and hæmorrhage into the stomach takes place. In rare cases, the hæmorrhage ceases, but the part from which it proceeded becomes the seat of ulceration, which may advance more or less, or even terminate in perforation. Ulceration and perforation of the stomach thus presents the following varieties:—1st, Erosion of the mucous membrane only, consequent upon chronic gastritis. 2d, Small ulcers, with red margins, more or less numerous, and scattered over an uninflamed surface, resulting from irritation or inflammation of follicles. 3d, Much larger ulcers, penetrating the muscular, or even the peritoneal coat, and often having the surface or substance of an adjoining viscus, as the liver, for their bottoms, or perforating a different portion of the canal, adhesions having formed around the ulcers: these are commonly single, oval, or round, are most frequently seated in the small curvature, or near the pylorus, and present no cancerous characters. 4th, Ulcers with ragged and inflamed margins, caused by corrosive poisons, and seldom penetrating the parieties of the stomach. 5th, Ulceration and perforation from without inwards, generally caused by an abscess of the liver opening into the stomach, adhesions of the peritoneum having formed around the ulcerated portion. 6th, One or more small ulcers, caused by atheromatous or fatty changes in the coats of the vessels, and by rupture of the villous membrane. 7th, Gelatiniform softening of the coats of the viscus. And 8th, Carcinomatous ulceration, &c. (§ 77. *et seq.*)

68. *B. The symptoms* of ulceration of the stomach are very equivocal. Several cases of this lesion have come under my observation; most frequently, however, when they have gone on to perforation and its consequences. They have occurred most frequently to females engaged in needlework, or as domestics. In most instances the patients have been more or less anæmied, or subjects of chlorosis, or of irregular, or painful, or scanty menstruation; and, although they had previously complained, for a longer or shorter period, of attacks of gastrodynia, or of spas-

the stomach, or even of attacks of vomiting, or of hæmatemesis, they have generally been able to pursue their avocations, and to take their food, up even to the period of the fatal seizure. The painful symptoms in these cases, as well as the attacks of vomiting or of hæmatemesis, usually followed a meal; and even when anæmia or cachexia was very manifest, no emaciation was generally present, the patient presenting much plumpness with the anæmia. The forms of ulceration and perforation, from the external to the internal tunics, and from disease of the vessels, are seldom observed, unless in persons of middle age, or far advanced in life; whereas the foregoing occurs most frequently in young females, although it is also met with in persons far advanced in age, and in males. In these there are generally evidences of a cachectic condition, and of a poor or morbid state of the blood. In addition to the symptoms already mentioned, in some cases, a gnawing sensation at the epigastrium, emaciation, flatulence, and various other dyspeptic disorders are experienced; but the appetite is often not much impaired, and, in some instances, neither the pain nor the vomiting is severe until the peritoneal covering is reached, or until perforation and its consequences occur. The attacks of hæmorrhage, in connection with one or more of the symptoms already mentioned, are amongst the most certain indications of the lesion. But it should not be overlooked that hæmatemesis occurs chiefly when much blood is poured out from the ulcerated part in a short time; for when the hæmorrhage is slight, frequent, and prolonged, the blood may pass the pylorus, and either be partially digested or more or less changed, and, mixing with the stools, be altogether overlooked. In this way, much of the anæmia observed before the fatal issue may be produced, hæmatemesis being either slight or altogether absent. When the hæmorrhage is not great, the matters vomited often have the appearance of coffee-grounds; and, in most cases, even when vomiting does not occur, the stools present a black or pitchy hue. These symptoms also attend malignant ulceration or carcinoma of the organ; but the absence of circumscribed hardness or tumour, and of the other symptoms of this latter malady (§ 78. *et seq.*), will assist the diagnosis.

69. C. *Treatment.* — The indications of cure are the same as advised for chronic gastritis (§ 60. *et seq.*). Mild farinaceous articles of food, or such diet as the patient finds to agree the best, and a judicious recourse to sedatives or narcotics, are the means most generally appropriate. The vomitings, especially of blood, often require to be arrested, and, with this intention, the means advised for *hæmatemesis* (see art. Hæmorrhage, § 174. *et seq.*) may be resorted to; or the spirits of turpentine may be exhibited in any suitable form, with or without small doses of creasote. If indications of perforation are manifested, by the occurrence of the symptoms of circumscribed or general peritonitis, large or repeated doses of opium, as recommended by Dr. Stokes, are chiefly to be relied upon, with such other aids as are advised when treating of this subject in the article on Peritonitis.

70. ii. Softening and Disorganization of the Coats of the Stomach.—This subject has received attention when treating of the organic lesions of the Digestive Canal (§ 35. *et seq.*).—*A.* This lesion occurs, as a primary disease, frequently in infants and children, most commonly soon after weaning, or after change of diet; but it may take place at any age, from two months and upwards, in children that have been improperly fed, or nursed by unhealthy females, especially in low, humid, close, and otherwise unwholesome localities. It supervenes also in the course of other infantile diseases, by which it is often masked, or which it may to some extent replace; and it is occasionally observed in the diseases of adults, but generally as a consequence or a contingency of their far advanced progress, as of tubercular consumption, &c. It is, in children, often a severe form of what has been commonly called the "*Weaning Brash,*" or the "*Atrophia Ablactorum,*" of Dr. Cheyne. This disease was first correctly described by M. Cruveilhier, and termed *gelatiniform softening of the coats of the stomach*; and by Dr. John Gairdner, of Edinburgh. About the same time it was also noticed by Jaeger, Zeller, and others referred to in the *Bibliography*. The softening extends, more or less, to all the coats of the viscus, and is most frequently observed in the vicinity of the spleen. The coats may not be only softened, but they may even be so eroded as to give rise to *perforation* at one or more points. In most cases, however, it is very difficult to determine how far the softening and disoganization have existed during life, and how far they may have been a *post-mortem* change. I have met with many cases of this malady, both primary and secondary, at the Infirmary for Diseases of Children, under the circumstances just mentioned, and I believe that the softening often exists to a considerable degree previously to death; but the advanced stage of disorganization, and more especially erosion and perforation, are early consequences of dissolution, which the fluids of the stomach may have been, more or less, concerned in producing.

71. *B.* This disease is met with most frequently in children between the ages of four and eighteen months, owing to the causes just mentioned; and it appears to be more prevalent in July, August, September, and October, than in the other months of the year. From the localities which favour its development, and the seasons which influence its prevalence, this lesion may be said to be almost endemic in certain places, and epidemic in some seasons. It may appear in the course of infantile remittent fever, of hydrocephalus, or of chronic bronchitis; or it may follow the cholera infantum, or scarlet fever, or diarrhœa, especially after weaning, or when the infant has not enjoyed the advantage of a healthy nurse, or is being brought up by hand.

72. *B. The symptoms* of softening of the gastric tunics are, during the earlier stages, chiefly, loss of appetite, mucous or muco-bilious vomiting, and diarrhœa, the stools being liquid, green, or curdy, and offensive; excessive thirst, progressive debility, prostration, pallor, flaccidity and coolness of the skin; occasional flushes of heat, alternating with chilliness; somnolency or lethargy, attended by uneasiness; a disposition to dose, with the eyes half shut, and the pupils turned upwards, &c. When the disease is more fully formed, the countenance expresses pain or uneasiness; the

look is languishing or sorrowful; and the child whines frequently, and is fretful. He is roused from his somnolency by the slightest touch, and, if any one looks steadily at him, even from a distance, he cries, and changes his position. His faculties and senses are unimpaired, but he is peevish and distressed. The absorption of fat is excessive; the eyes are sunk in their sockets; the pupils are contractile, and there is no strabismus. Emaciation and flaccidity of muscles proceed rapidly; the lips and tongue become dry and cracked; and the vomiting of the food is frequent; the stools still continuing green, with shreds resembling spinach and slime: the urine is generally scanty. The pulse is at first slow, sometimes intermitting, but it becomes very quick and small towards the close. Flatulence and hiccup sometimes accompany the vomiting, and cough is not infrequent. The respiration is not materially affected until near the termination of the malady, when it becomes quick and laborious. The abdomen is rarely much swollen, although it generally is flatulent, and resonant on percussion. Ultimately, a pallid and shrunk countenance, red or inflamed eyelids, emaciated, flaccid, and cold extremities, a fluttering pulse, very quick breathing, restlessness, or somnolency, passing into insensibility, terminate life, generally in a very few days, and sometimes even in a few hours.

73. *B. On Dissection*, the appearances observed vary with the circumstances and associations of the disease, — as it is primary or consecutive of some other malady, — and with the period which has elapsed from dissolution. Although the changes cannot be altogether ascribed to dissolution, on the one hand, or to the action of the gastric juices on the other, they may be heightened by either, or even by both. That they exist, to a greater or less extent, in respect even of all the coats of the stomach, but especially the villous and cellular tissues, and that they amount to a very manifest loss of the vital cohesion of these structures, I have been convinced by a careful observation of the phenomena preceding death, and by examination made as early as ten or twelve hours after death. The softening and dissolution produced by the gastric juices after death have been described under the article DIGESTIVE CANAL (§ 41.), and are chiefly observed in the most depending parts of the viscus. But the gelatiniform softening found after death in cases which have presented the above symptoms, either as a primary malady, or as an epi-phenomenon in the course, or at the close, of some other disease, has evidently commenced with the development of these symptoms, and has advanced until it was incompatible with the continuance of life. As it is generally the only or chief lesion found on dissection in the primary cases, and as it has been found in a very marked form even when the examination has been made a few hours after death, there is every reason to infer that it has commenced and existed previously, although it may have advanced further after death had taken place. The situation of the softening, in some cases, precludes the opinion that it could have been produced by the action of the gastric juices; and if it have been thus caused, to what other lesion can the severe, rapid, and fatal symptoms characterising the primary cases be imputed, seeing that none besides it can be detected either in the digestive organs or elsewhere, at least none sufficient to produce death? It should not be overlooked, also, that similar softening, although much less remarkable and extensive, is sometimes found, in these cases, in some portions of the duodenum or of the small intestines; and is to be referred to the same states of vital action, &c. (§ 74.) as produce this lesion in the stomach.

74. Viewing, therefore, this alteration of the coats of the stomach as a primary, as well as a consecutive disease, the question arises as to the nature of the change, — whether is it inflammatory, or is it the result of a vital impairment of the coats of the organ? or is it an association of both, a form of asthenic or cachectic inflammation? That it is not inflammatory is shown by the absence of vascular injection. That it proceeds chiefly from vital exhaustion, with impaired nutrition and cohesion of the tissues, may be inferred from the appearances after death; but it cannot be admitted that the whole amount of change is thus produced, as it may have been heightened immediately, or soon after death, especially when the change is most remarkable. This lesion, however, should be carefully distinguished from *solution of the coats of the stomach by the gastric juices after death*. This *post-mortem* change, which has been described when treating of the alteration found in the DIGESTIVE CANAL (§ 35. *et seq.*), may occur after death from any cause, and in cases that have presented none of the symptoms attending the disease now being considered; but it may take place also in cases of this disease, and may either increase the softening previously existing, or even attack another portion of the parietes of the organ to which the gastric juices have gravitated.

75. *C.* The *Treatment* of the combination and procession of morbid phenomena, constituting this disease, whatever may be the amount of organic change existing previously to death, or occurring subsequently, is the matter of chief importance. For cases frequently occur (and I have seen many of them, both in public and private practice) presenting all the symptoms of this disease, in greater or less severity, and proceeding with proportionate rapidity, for some of which treatment has been successful at an early period, others having gone on to a fatal issue, and manifested softening of the coats of the stomach, without either vascular injection or thickening, and often with diminished vascularity and unusual pallor of the tissues (*see* DIGESTIVE CANAL, § 35. *et seq.*). When an opportunity is afforded the physician to treat the early stage of the disease, or even a more advanced state, more or less benefit will be derived from a healthy and young wet-nurse, the infant always sleeping in her arms. If, however, such a nurse cannot be obtained, or if the child cannot take the breast, ass-milk, warm from the animal, slightly diluted either with simple water or with lime-water, should be given at regular intervals; and various tonics astringents, and antacids be exhibited in the intervals. The diet, consisting of various farinaceous articles, should be carefully attended to taking care not to load the stomach, so as to favour the occurrence of fermentation or acidity. When the ass-milk is taken in sufficient quantity, but little more food is required, and sweets

should always be avoided. The medicines which I have found most beneficial are cretaceous mixtures or powders, with small doses of cascarilla, cinnamon, and a very minute quantity either of creasote, or of tannin, or of capsicum. In some cases, especially when the urine has been ammoniacal, or contained much of the phosphates, I have prescribed small doses of the pyroligneous acid in an infusion of cascarilla or cinchona, or of the nitro-muriatic acids in the same or similar vehicles, or the muriated tincture of iron, with infusion or tincture of calumba. The great difficulty in these cases is to arrest the vomiting and diarrhœa; but this cannot be accomplished by sedatives, and narcotics are most injurious to young children. In some cases, however, especially in older children, the hydrocyanic acid may be given in suitable doses, with the sesquicarbonate of ammonia, and with tonics and astringents. The irritability of stomach in this disease is more readily relieved by stimulants and tonics than by other means; and even the oleum terebinthinæ will often arrest this state when other means have failed. In most instances, also, aromatics should be given with cretaceous and alkaline medicines, and a terebinthinate embrocation may be applied to the epigastrium. If these means should confine the bowels, the risk of increased irritability of the stomach may be thereby incurred, and therefore suitable enemata ought to be administered, if the stools be insufficient or much disordered. In other respects the treatment should be directed, and the regimen conducted, as advised for INDIGESTION, and above for nervous or functional affections of the stomach (*see* § 14. *et seq.*). In every instance, the more remote causes of this malady, arising either from the locality or the circumstances of the case, ought to be carefully ascertained and removed as far as possible, and change of air, especially to a temperate, pure, and dry air, should be advised, with the use of chalybeate medicines or waters, or such other means as are most likely to improve the vital cohesion and tone of the coats of the stomach.

76. When we have any reason to infer from the state of the stools, or other symptoms, that more or less softening, or loss of vital tone, extends to the mucous surface of the intestines, the means now advised, aided by such others as have been recommended when discussing the treatment of *chronic* DIARRHŒA (§ 29. *et seq.*), or of *asthenic* DYSENTERY (§ 88. *et seq.*), will often be found appropriate and successful.

. 77. iii. SCIRRHOUS, CANCEROUS, OR MALIGNANT LESIONS OF THE STOMACH. — *Cancerous and Cancroid Growths*, Prof. BENNETT. — *A. Carcinomatous and malignant formations of various kinds* are formed in the stomach, especially in or near the cardiac and pyloric orifices, and probably commence, especially the scirrhous and scirrho-carcinomatous kinds, as I have contended when describing them under the head DIGESTIVE CANAL (§§ 50, 51.), in hypertrophy of the subvillous cellular tissue. The scirrhous change either originates in, or is superinduced by, degeneration or modification of nutrition and secretion, consequent upon prolonged irritation, morbid diathesis, advancing age, and depressed vital power. The several kinds of malignant growths have been found in the coats of the stomach (*see* arts. CANCER and SCIRRHOUS AND OTHER GROWTHS). The scirrhous forms are most frequent in the pyloric extremity of this viscus; whilst the medullary, the milt-like, the fungoid, the colloid, the hæmatoid, and other modifications of the encephaloid form of cancer, may commence in the cardiac orifice, or in any part of the gastric parietes. Whilst scirrhous and scirrho-carcinomatous degeneration is generally of slow progress, and occurs in advanced age, the medullary, encephaloid, or fungo-hæmatoid (*see* art. FUNGOID DISEASE), occurs at any age, but more especially in early age, is more generally developed in the form of distinct tumour, is more rapid in its progress, and often appears simultaneously or consecutively in different parts. *Perforation* of the stomach may occur as a termination of malignant disease, especially of the carcinomatous form of ulceration (*see* § 86. *et seq.*).

78. *B. The symptoms* of malignant disease of the stomach are often very equivocal during the early progress of its several varieties; and it is often not until the lesion is far advanced that they can be relied upon. The chief symptoms are—1st, Pain at the epigastrium or its vicinity; 2d, Indigestion, loss of appetite, flatulence, acrid eructations, nausea, and vomiting; 3d, The presence of a tumour in or near the gastric region; and 4th, Emaciation and a cachectic or yellowish anæmic hue of the surface; and various other constitutional phenomena.

79. (*a.*) The *pain* at the epigastrium is generally gnawing or burning, sometimes lancinating. Occasionally, and at first, it is not much complained of, unless pressure is made on the stomach; and often the slightest pressure cannot even then be long endured, although no acute pain is thereby produced. The pain may be increased either by an empty or by a full state of the viscus. Sometimes the pain recurs at intervals, and becomes remarkably severe. In many cases it extends to the hypochondria, or to the back, or along the œsophagus. In others, especially the cancerous or carcinomatous, a lancinating pain is present at an early period, and is amongst the first symptoms to announce the nature of the malady. In the fungoid or encephaloid disease, pain is often slight or almost wanting.

80. (*b.*) The *symptoms of indigestion*, as anorexia, nausea, vomiting, &c., are often amongst the earliest; but they cannot be relied upon, as they may be absent to the very close of the malady. MM. CHARDEL, CRUVEILHIER, ANDRAL, and FERRUS state, that they have met with cases in which no more severe symptoms than those of slight indigestion had been present up to the period of dissolution. Such instances are very rare; but I have seen cases in which vomiting had not occurred until very shortly before death; the matters vomited having been then very dark and grumous, or sanious, from the exudation of blood from the diseased part. The vomitings which accompany malignant disease of the stomach have been ascribed to obstruction of the orifices of the viscus. They doubtless very often are dependent upon this cause, but they often also occur where these orifices are free, or where the lesion is seated in other parts of the parietes. When vomitings are not frequent or are absent, it may be presumed that the pyloric orifice is free. When, however, vomitings occur

some time after the ingestion of food, with marked frequency or constancy, and nearly after the same interval, then disease of this orifice may be suspected.

81. When the ingesta are returned immediately after having been swallowed; when deglutition is followed by a sensation of obstruction under the lower part of the sternum, or by a feeling that the food does not pass into the stomach; when the aliments are ejected instantly without change, and mixed with some glairy mucus; or when there is much nausea, without much evacuation by the mouth, excepting glairy matters; then it may be inferred that the disease is seated in the cardiac orifice of the stomach. In these cases the pain is more limited to the epigastrium and beneath the sternum, often extending to the back.

82. The characters of the vomited matters vary with the seat, nature, and progress of the malady. When the pylorus is the seat of lesion the matters thrown off may be more or less digested, but at a far advanced period, or shortly before death, the ejected matters contain altered blood, and present numerous brown or black minute flakes, ultimately passing into the appearance of coffee-grounds, or nearly resembling the black vomit of pestilential fever. In the fungoid or encephaloid form blood is often poured out in larger quantity, and occurs in a purer form or less altered, in the ejected matters, thus closely resembling the hæmatemesis of simple ulceration of the stomach, from which, however, it is generally distinguished by the existence of tumours in the gastric region, in this malignant form of lesion.

83. (*c.*) The presence of *tumour* in or near the epigastrium is an important symptom of malignant disease of the stomach. When scirrhous induration or other form of malignant tumour exists in the pylorus, then it may not be detected at the epigastrium; but, owing to its density or size, and to the extreme distension of the viscus, it may have descended much lower, or even somewhat to either side, according to the position of the patient. Malignant disease may, however, exist in any portion of the parietes of the organ, without occasioning much tumour, and even when it does to a moderate extent, it may not be detected, unless when the patient is very much emaciated, which is not always the case; and when it is detected, it is often difficult to distinguish it from tumour of the pancreas, or of the liver, or spleen, or of the omentum.

84. (*d.*) The *cachectic* and anæmied character of the countenance and general surface, and the peculiar earthy *odour* sometimes exhaled from the body, are observed chiefly at an advanced stage of malignant disease, and are to be attributed chiefly to the constitutional taint, and to the alteration and deficiency of the blood, these changes not being always attended by emaciation, although they are more frequently thus attended. This appearance, however, very generally accompanies malignant lesions of other organs; and it is, therefore, from the association of it with the other symptoms already noticed that the seat of the present malady can be inferred.

85. (*e.*) *During the progress* of the malady the symptoms often vary much: certain of them become more severe, others are alleviated; and the severity of the disease is for a period somewhat abated. But after an uncertain period, and after some error in diet and regimen, or after mental emotion, the symptoms recur with increased severity, or even additional phenomena are observed, especially aggravated pain, vomitings, eructations, borborygmi, hiccup, constipation of the bowels, colicky pains, &c. When the disease is seated in the pylorus, its progress is not merely slow, but the character of the vomiting is generally different. Food may not be thrown off the stomach during the early course of the malady, or not until the orifice becomes much contracted or obstructed, or nearly the close of life; and generally vomiting does not occur until a considerable period after food has been taken. Very frequently, also, articles which have been taken several or many hours previously are thrown up more or less digested, whilst those which have recently been taken are retained. This, very probably, is owing to the circumstance of the latter being directed to the fundus of the viscus, whilst the former having been digested, and having reached the diseased pylorus, are thrown backwards and upwards to the cardia.

86. (*f.*) The *duration* and progress of the malady depend much upon the seat and nature of the lesion. If it be seated in or near the cardia, and if it be the encephaloid or fungoid variety, the duration is much shorter than when it is of a scirrhous or scirrho-carcinomatous nature, and is seated in or near the pylorus. In the former, also, the pain is less acute, and the hæmorrhage is earlier and more distinct, than in the latter. Cancerous ulceration may supervene in either variety of malignant disease, and may go on to *perforation*; but in these, neither is lymph thrown out, nor are adhesions formed, so as to prevent a communication with the peritoneal cavity. Perforation, however, seldom occurs, death generally taking place before the carcinomatous ulceration has proceeded so far. During the progress of the malady, costiveness, or even constipation, is a most troublesome symptom; but occasionally when the pylorus is not obstructed, or when its valve is destroyed by ulceration, a portion of the sanious discharge from the ulcerated parts pass into the intestines and occasion colicky pains, diarrhœa, or dysenteric stools, and accelerate the fatal issue. When perforation of the parietes of the stomach is produced, violent peritoneal symptoms are immediately occasioned, and soon terminate life.

87. The duration of the malady can rarely be ascertained with precision; for dyspeptic symptoms, of greater or less severity, and more or less numerous, always precede the manifest development of malignant disease, which even may not be distinctly declared until shortly before death. The antecedent dyspeptic symptoms are generally thus present for years before the nature of the disease can be ascertained, and when ascertained death may ensue in a few weeks or even days. The duration of the malady is, however, rarely less than several months, and is generally as long as several years. When it is seated in the cardiac orifice, and nearly obliterates the passage into the stomach, the duration is much shorter, and the sufferings of the patient most distressing, and the emaciation greater. But several months or even years may elapse before the lesion has advanced so far as to amount to this extreme pitch.

88. *C.* The *Diagnosis* of cancer of the stomach

sometimes very difficult; for when there is no tumour detected it may be mistaken for chronic gastritis, or for simple ulceration of the stomach; and when there is tumour, the pancreas, liver, or spleen may be its seat. For either instance it is impossible to assign infallible diagnostic signs. The history of the case, the association and procession of the symptoms, the nature of the causes and antecedents, the *juvantia* and *lædentia*, and the constitutional symptoms, in either state of disease, will chiefly guide the attentive observer. Generally, the discharge of blood from the stomach is much greater in simple ulceration than even in the hæmato-fungoid variety of malignant disease. In the great majority of cases, also, no blood is found until a far advanced stage, or until shortly before death, and then the blood presents the coffee-ground or minute flaky appearances already noticed, occasioned by its minute quantity and altered character. If considerable hæmorrhage occur in the advanced stage of fungo-hæmatoid cancer, or of other varieties, there is generally more or less tumour or hardness, which may often be detected upon a careful examination. But it must be admitted that hæmatemesis may, and does, often accompany tumour of the spleen, liver, and pancreas, more especially the spleen and liver. The various circumstances and peculiarities of the case, of its progress, and of its concomitants, will be duly considered by, and will guide, the cautious and observing physician.

89. *D.* The *Causes* of malignant disease of the stomach are chiefly those which I have fully stated when treating of Cancer (§ 23. *et seq.*) and Fungoid Disease (§ 16. *et seq.*). To these places I refer the reader; but I may very briefly notice at this place the causes which act more especially on the stomach. Cancer of this viscus is much more frequent in males than in females, probably owing to intemperance, and to depressing emotions of the mind, being more frequently and more permanently experienced by the male sex. Scirrhous or scirrho-carcinomatous forms of malignant disease of the stomach are seldom observed before middle age; and are most frequent in the advanced epochs of life. Hereditary predisposition, or constitutional taint, derived from a parent, has evidently a considerable influence in favouring the occurrence of the malady when other causes concur to develope it. This predisposition was remarkable in the case of the great Napoleon. In what this diathesis consists is not clearly shown; but the temperaments, in which it has been supposed most frequently to occur, are the nervous and lymphatic, or those mixed with the sanguine or bilious. The ranks of life in which it is most frequently observed, are the middle and higher ranks, owing probably to their greater liability to anxieties of mind, and the depressing mental emotions, which, with inanition, protracted abstinence, excessive application to study, business, &c., are the most influential causes of the malady. Protracted functional disorders of the stomach, the air and water of certain localities, the abuse of spirituous liquors, frequent or constant pressure on the gastric region, and the other causes mentioned when treating of Cancer, frequently aid profound or prolonged chagrin and anxieties of mind. Various trades, professions, and occupations have been said to favour the occurrence of the malady, but with insufficient reason, or in no very appreciable degree. (See arts. Cancer and Fungoid Disease.)

90. E. Treatment.—During the commencement of cancerous affections of the stomach, there is seldom sufficient evidence of the nature of the disease to induce the physician to employ means for its arrest; and even when its nature is suspected, or correctly inferred, there is no known remedy which is capable of producing this effect. At this period, when the symptoms are chiefly those of chronic indigestion, or of chronic gastritis, the means which have been found most beneficial for these diseases, and such diet and regimen as the patient experiences the most benefit from, are also most serviceable in cancerous affections of the stomach. Even if these affections were recognised at this early period, there would be very great difficulty in devising more suitable means than those usually found most serviceable in functional disorders of the organ. If the malady be inferred to exist at this early period, or if it have more manifestly declared itself at an advanced stage, all that can be expected from treatment is—1st, to alleviate the more distressing symptoms; and, 2ndly, to retard the progress of the malady; and these ends may generally be partially attained.

91. It has been very justly remarked by M. Gibert and adopted by Dr. Houghton, that "our predecessors, who were less acquainted than we with the fatal progress of organic lesions, succeeded, perhaps, oftener than we do in palliating the symptoms and prolonging the lives of patients, by applying themselves incessantly to oppose the most obvious symptoms. Their attention was not entirely preoccupied, like that of the anatomist-physicians of the present day, with the incurability of the local lesion which is the source of the disease." But, whilst the fulfilment of the intentions proposed to ourselves when treating this malady, should be kept in view, the predisposing and exciting causes, mentioned above, and under the article Cancer, ought to be removed or counteracted by treatment, medical and regimenal, as far as may be possible. Whenever obstinate or prolonged dyspepsia, or symptoms of chronic gastritis, occur in an individual whose parent or grandparent died of this malady, then suspicions of incipient cancer of the stomach should be entertained, and the treatment ought to be directed accordingly. If these suspicions should not be confirmed, the means advisable for the more dangerous malady would not be inappropriate for the more slight; indeed they will generally prove the most rapidly beneficial.

92. There are few causes which more injuriously affect the digestive and assimilating functions than the depressing mental emotions and anxiety; and therefore these should be avoided by relinquishing avocations which involve such emotions. The greatest care ought also to be exercised in the choice of food. The patient should be guided in this by his sensations and experience; but generally the farinaceous articles of food, taken in moderate quantities, and not after too long intervals, yet in sufficient quantity to duly nourish the frame and support organic nervous power, will be found the most suitable. These may be taken in, or with, animal broths or soups, in small quantities, or with jellies, &c. I have often recommended new-laid eggs, merely warm, and asses' milk, warm from the animal, with a

small portion of lime-water, with much benefit. The great object in the treatment of inferred cases of malignant disease of the stomach is to furnish bland and unirritating nourishment in sufficient quantity, without exciting or distending the organ. But, whilst these and other articles of diet are allowed, with such others as are mentioned when treating of Indigestion (§§ 42. 55. *et seq.*), or are found by the patient to agree with him, the more painful symptoms should be allayed by suitable narcotics, or by hydrocyanic acid, prescribed in conjunction with emollients, demulcents, or mild bitter tonics. I have met with cases of inferred internal cancer, for which I have prescribed a vegetable and farinaceous diet, distilled water for all the purposes for which water is required, as advised by Dr. Lambe, and residence in a dry and mild air, and very great benefit has been derived from the treatment.

93. As to the use of the several narcotics, but little can be added to what has been stated under the head Cancer (§ 30. *et seq.*). I have preferred the more common preparations of opium, to either the acetate or muriate of morphia, in malignant disease of the stomach, the latter frequently proving injuriously depressing, without affording any countervailing advantage. The combination of narcotics, as of conium with henbane or poppy, or of opium with hop, or the infusion of hop with henbane or hydrocyanic acid, has often been serviceable. As the disease advances, the necessity of having recourse to palliative means increases, and the doses of these require also to be augmented. But it will be found that these remedies, however great the dose, frequently fail in preventing or arresting the vomiting in the advanced stages of the malady, if solely relied upon. They should, therefore, be conjoined with such stimulants and aromatics as may be found most serviceable in such circumstances, as creasote, musk, sumbul, &c. I have very rarely observed much benefit to accrue, beyond a very temporary relief, from aconite, belladonna, or stramonium. Nevertheless they may be tried in similar combinations to those just now mentioned. If acidity or flatulence of the stomach be much complained of, ammonia, magnesia, or other antacids may be given with narcotics and aromatics; or lime-water may be taken with boiled milk, or with asses' milk. The iodide of potash, in small doses, may also be tried in conjunction with the carbonate of potash, or the solution of potash, or Brandish's alkaline solution, and with narcotics and aromatics; but I have seldom seen any benefit derived from it in malignant disease of the stomach. If hæmorrhage from the stomach be indicated by black or pitchy stools, or if hæmatemesis occur, the spirits of turpentine may be prescribed in such forms or combinations as have been recommended above (§§ 59. 69. 75.), or where Hæmorrhages of these kinds are considered.

94. The constipation attending malignant diseases of the stomach often proves a great source of trouble or distress to the patient, and a great difficulty to the physician. Enemata should be daily employed; but, however active the substances which may be administered in these, they often fail of producing satisfactory results. Calomel is often too depressing, as respects the vitality of the stomach, especially when repeated, and irritating or drastic purgatives ought to be avoided. The preparations of senna or of rhubarb may be conjoined with vegetable tonics, with magnesia, or with manna, or phosphate of soda, citrate of magnesia, &c., or with such other aperients as may be found to be retained by the stomach.

95. The thirst, heat at stomach, nausea, and vomitings, which are often so distressing in the course or near the termination of the malady, can seldom be altogether allayed, although they may be sometimes partially relieved, by exhibiting effervescing beverages with bland nutrients, or mild stimulants, as Seltzer-water with milk, and a small quantity of weak wine, as hock, Barsac, &c.; or soda-water, or effervescing lime-water, with the same articles; or spruce-beer, or small quantities of weak tar-water, with milk, &c.; and by making these the vehicles in which the medicines most appropriate to the case may be given. The retchings and vomitings are sometimes relieved by combining creasote with opium and cretaceous powders or mixtures; and epithems, with the vinum opii, or with one or other of the warm embrocations prescribed above (§ 59.), to which the opiate is added, may be applied over the epigastrium. If diarrhœa, or extreme vital depression, or spasms, supervene, these means, aided by the more powerful stimulants, absorbents, and astringents, may be administered; but no further advantage than a temporary relief can be expected from them.

96. iv. Other Organic Lesions of the Stomach are occasionally observed, but they can rarely be distinguished during life; and, when met with upon dissection, the only particulars which can generally be obtained as to their origin and the symptoms attending them, are such as usually accompany chronic gastritis, or scirrhous or malignant diseases of the organ. These lesions have been fully described in the article Digestive Canal (§§ 27. *et seq.*); and to that I beg to refer the reader. — *A.* Those alterations which are most frequently observed, are generally consequent upon prolonged irritation, and upon excesses in eating and drinking, and consist chiefly of *hypertrophy of the villous and muscular coats and of the connecting cellular tissue*, existing either singly or in combination. They may not be attended by any serious symptom, and be detected only after death from some other disease. When, however, they are seated in either the cardiac or pyloric orifices of the organ, and are attended by much thickening of the part, they occasion more or less disorder, according to the amount of obstruction they produce; and in such circumstances they may be mistaken for, although different from, malignant disease of the viscus. It is very rarely that very serious symptoms are occasioned by these alterations, unless ulceration supervene in some part of the thickened or hypertrophied structure; and in such cases, it is very difficult to determine whether or no the alteration be truly scirrhous, which it most probably often is, if the hypertrophy or thickening be chiefly seated in the submucous cellular tissue.

97. In these cases, whether they result merely from prolonged irritation, excitement, or inflammatory action, or whether they be incipient cancer, the *treatment* should not be materially different from that which has been advised for other diseases of the stomach, namely, to improve the general health, to promote the constitutional powers, and to remove or to reli-

the symptoms which are either most important or most urgent. With these intentions, change of air, travelling, the use of mineral springs, or waters suited to the symptoms most complained of, and attention to diet and regimen, should be recommended.

98. *B. Alterations of the Capacity of the Stomach* are sometimes observed (see Digestive Canal, § 52. *et seq.*).—*a. Increased capacity* is generally a consequence of more or less obstruction at the pyloric orifice or its vicinity. In cases of scirrhous or cancerous pylorus, the stomach is often remarkably increased in capacity; and when the pylorus or upper portion of the duodenum is constricted from other alterations, increased capacity of the viscus is also generally observed. In a case in which inflammation of the concave surface of the liver extended to the pylorus and head of the duodenum, and was followed by false membranes and adhesions of these parts, the subsequent organization and contraction of the morbid productions had so completely constricted the pylorus, as to prevent the passage of a quill through it; the patient having died under my care with symptoms, which were referred to scirrhous pylorus, and with enormous dilatation of the stomach. In some cases, the increase of capacity is attended by hypertrophy of the muscular and villous coats; but this is observed only in some of the more chronic cases of scirrhus of this orifice. In others, the increased capacity is attended by remarkable thinness of the coats. Greatly enlarged capacity of the organ, with hypertrophy of the coats, has been observed in some cases in which habitual gluttony had existed during life. In such instances, increased function or action had developed the growth of the structures and the size of the organ.

99. *b. Diminished capacity* of the stomach is also sometimes seen (see. Digestive Canal, § 53.), but most frequently in consequence of inanition, or in connection with hypertrophy of the coats, or with scirrhous or other malignant diseases of the organ. It may be occasioned also, although very rarely, by the cicatrization of ulcers, or by the contraction of false membranes, or of organizable lymph thrown out upon the serous surface of the organ. Extreme diminution of capacity is caused by the passage of acrid, corrosive, or astringent poisons into the stomach, especially the mineral acids; and is then not infrequently attended by abrasions of the villous coat. Kiernander observed it after poisoning by nux vomica.

100. *C. Attenuation of the gastric tissues* is not often observed without any other change. It is most frequently seen in cases of obstruction of the pylorus, and then is often associated with increased capacity, especially at or near the fundus of the organ. But it is met with, also, without any increase of size. Several other alterations of structure have been found in the stomach, namely, *anomalous fibrous and fibro-cartilaginous formations, tubercular ulcerations, fatty or lipomatous tumours in the connecting cellular tissue, fistulous openings through the coats of the stomach and parietes of the abdomen, or some other part of the digestive canal, and various displacements of the organ*, &c. But these are of very rare occurrence, and seldom admit of diagnosis or of relief during life. (See arts. Digestive Canal; Cancer; Disease, &c.)

101. *D. Rupture or laceration* of the coats of the stomach has been observed after vomiting or retchings in the course of disease or of ulceration, especially when the coats have been attenuated or softened in parts, or where ulceration has penetrated the muscular coats, and nearly or altogether reached the peritoneal surface. The same result has followed from distension of the viscus by ingesta, or more probably from the reaction of the parietes upon the distension. Rupture of the stomach is not infrequent after falls, or violent blows on the region of the stomach, especially when distended by a full meal.

102. *E. Wounds* penetrating the walls of the organ are generally fatal; but in some instances recovery has taken place from them, either with or without a fistulous opening in the abdominal parietes. Whilst lacerations are always fatal, wounds may fail of proving fatal, the coats contracting so as to prevent the passage of the contents of the viscus into the peritoneal cavity, and closing up and ultimately cicatrizing; or if continuing open or fistulous, the lymph exuded around the wounded peritoneal surfaces agglutinating them, and preventing the consequences observed in other circumstances.

103. *F. Numerous foreign bodies*, which have been swallowed, may be retained for prolonged periods in the stomach, and produce various effects according to their natures or their chemical or mechanical properties or conditions. They may irritate, inflame, ulcerate, or even perforate the viscus. The irritation may be soon followed by their rejection. Even blood, effused from ulcerated parts, or diseased vessels, of the organ, or that which has passed into it from the nares, fauces, or pharynx, when present in considerable quantity, will be thrown off; but, when it is present only in small quantity, it will pass the pylorus into the intestines, and give the stools the characters of melæna. Cases on record are numerous in which foreign bodies have been retained for weeks and even months in the stomach, and either have been afterwards thrown up, or found there on dissection, or have caused ulceration and perforation, not only of the stomach, but sometimes also of the adjoining viscera or parts.

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Bibliography and References to *Arts*. Colon, Digestive Canal; Duodenum; Indigestion; and Pyrosis.

STOMATITIS.—Synon. *Stomatitis* (from στόμα, the mouth). *Stomacace, Oris Vitium, Buccitis. Buccite, Stomatite, Inflammation de la Bouche,* Fr. *Inflammation of the Mouth.*

Classif.—III. Class. I. Order (*Author in preface*).

1. Defin.—*Inflammation affecting the mouth, especially the gums and cheeks, attended by more or less constitutional disturbance, and characterised, as respects the local changes, by the nature of this disturbance, by the causes, and by the state of vital power.*

2. Inflammation of the mouth, or stomatitis, may be either a primary or a secondary or sympathetic affection. It is rarely limited to the gums and cheeks; but extends, more or less, in most of its forms, to the fauces and pharynx, and even partially to the tongue and lips. According to the sthenic or asthenic character of the inflammation,—to the local changes and the constitutional disturbance,—to a previously healthy, or to a cachectic or contaminated state of the system,—and to the influence of the exciting causes, stomatitis presents several *species*, more or less distinct, and hence deserving of being treated of as specific affections, yet, owing to their seat, and not infrequently to their consequences, requiring to be viewed as generically related to each other. The several affections which may be classed under the present head appear, either primarily or consecutively, under so different circumstances, that it may be truly stated that there are few diseases affecting the same parts so dissimilar to each other as these are. This dissimilarity, arising, as just stated, from the different exciting causes of each, from the states of vital power and of the circulating fluids, from the nature of pre-existing disease, and from the age and various other circumstances of the patient, gives occasion for the arrangement of the several forms of stomatitis into the following *species*:—1st, simple or erythematic, *stomatitis simplex*; 2d, vesicular, *st. vesiculosa*; 3d, pultaceous, *st. pultacea*; 4th, mercurial, *st. mercurialis*; 5th, pseudo-membranous, *st. pseudo-membranacea*; 6th, ulcerated, *st. ulcerata*; 7th, gangrenous or phagedenic, *st. phagedænica*. The *second* and the *third* of these *species* I shall describe under the head Thrush, the term usually applied to them; the others will be briefly treated of at this place.

3. I. Stomatitis Simplex, *simple or erythematic inflammation of the mouth,—Buccite, Aphthes érythématiques,*—is characterised by redness, heat, dryness, pain, and slight swelling, of a part or of the whole of the mucous membrane lining the mouth. It is most frequently limited to either the arch of the palate, to the tongue, to the gums, or to the cheeks. It is often extended to two or more of these, but it more rarely invades the whole of the buccal surface. It frequently extends backwards to the isthmus of the fauces, to the pharynx, and even to the upper part of the œsophagus. It is not an infrequent complication of gastritis, or gastro-enteritis, or of bronchitis, and is generally more or less remarkable in the exanthematic fevers, and in an advanced stage of hectic. When the inflammation has followed a local irritant or poisonous substance, then the pain, heat, and swelling are often very severe, and the effect more diffused. In some instances the inflammation is attended by dryness, in others by a discharge of a ropy mucus, mixed with saliva, more or less abundant, according to the nature of the exciting cause. Occasionally the irritation extends along the Eustachian tube to the ear; and in many instances the tonsils are more or less affected.

4. *A.* Simple stomatitis thus presents numerous phases or states, as it is more or less general or limited, or according to its severity, to its complications, to the age of the patient, and more particularly to its cause. It may be general or diffused, or limited to patches, or to parts, or consisting of numerous points. It may or may not be attended by the symptoms of general fever, which usually assumes either an asthenic or sthenic character, according to the severity of the attack and the constitutional power of the patient. It generally presents acute features, and terminates in a few days, by resolution, without either suppuration or ulceration, the epithelium being commonly detached. But suppuration is occasionally produced when the inflammation has been intensely excited by an energetic irritant poison, or even by the more common irritants in unusual quantities. I have thus seen a very general stomatitis, with profuse suppuration, follow the introduction of a quantity of mustard into the mouth. Ulceration is more frequent than suppuration, and is seen chiefly in the gums, insides of the cheeks, and on the surface of the tonsils. Generally, however, the inflammation has become chronic before ulceration to any considerable extent takes place.

5. *B.* The *chronic state* of simple stomatitis is chiefly confined to the gums, and is often kept up by carious teeth or stumps of teeth. In the worst of such cases the gums not only ulcerate, but the alveolar processes, either partially or more generally, become absorbed, and the teeth fall out. These cases are commonly symptomatic of general cachexia, or of prolonged disorder of the digestive organs, especially chronic dyspepsia or chronic gastritis.

6. *C.* The *treatment* of simple stomatitis is generally easy, when the affection is produced by a manifest irritant cause; for the removal of this cause, and rinsing the mouth frequently with cooling and demulcent fluids, will be efficacious in the course of a few days. When this affection is a part only of a more general and a more serious complaint, the local means can be subservient only to more constitutional and energetic remedies, and these must be such as the nature of the complaint will warrant. The state of the alimentary canal and of the digestive organs should receive particular attention, and morbid secretions and excretions, and fæcal accumulations, be freely evacuated. In many cases, washing out the mouth with camphor water, or with a decoction of marsh-mallows, containing a little nitrate of potash or sulphate of alumina, or, in more painful cases, holding the open mouth over the vapour of hot water, into which some vinegar and scraped camphor has been put, will be sufficient to remove the disorder, especially when aided by suitable purgatives. In more chronic and obstinate cases, especially if ulceration have taken place, strong solutions of the nitrate of silver, or weak solutions of the bichloride of mercury, may be required. Most of these states of the disorder, even when unconnected with secondary syphilitic disease,

depend upon cachexia and chronic disorder of the digestive organs; and to these latter the treatment should be mainly directed. For these obstinate and complicated states, the means about to be prescribed for a severer variety of this complaint will be found appropriate (see §§ 31. *et seq*).

7. II. PSEUDO-MEMBRANOUS STOMATITIS. — *Stom. Pseudo-membranacea.* — *Stomatite Couenneuse, St. Dipthéritique, Dipthérite Buccale*, Fr. — This peculiar form of stomatitis, as it affects either the mouth or throat only, or as it extends not only to both, but also to the pharynx, larynx, and even to either the trachea or œsophagus, was first accurately described by M. BRETONNEAU, and subsequently by M. TROUSSEAU and Dr. MACKENZIE, by whom it was observed to occur in an epidemic form. In some districts of France, especially the more extended or diffused state, it was on several occasions a remarkably prevalent and fatal malady, and was considered by the best informed writers to have been propagated by infection. This very severe and epidemic form of *angina* will receive due attention when the diseases affecting the THROAT are described. I shall, therefore, notice at this place only the less severe and limited form of the malady, which affects the mouth primarily, and is most frequently confined to this part.

8. *A. Pseudo-membranous stomatitis* has been confounded with various other affections of the mouth. It may assume either an *acute* or a *chronic* form; and is generally more or less diffused when acute, and limited to one part when it assumes the latter form. It is observed chiefly on the gums, insides of the cheeks and lips, and on the point or around the tongue. In the *acute state* it first appears in the interior of the mouth in the form of small, irregular, rounded or oblong membranous patches of a greyish-white colour. Around these patches the surface is red, and the parts are painful and hot, a sense of heat or burning being complained of. The breath is fœtid, and the submaxillary glands enlarge. As the disease proceeds, the patches of membranous exudation extend, become more or less detached, and are succeeded by others, and the intervening surfaces are red and swollen: The tongue is swollen. The mouth is continually open, allowing the escape of altered saliva. The enlargement of the lymphatic glands increases; the face swells; the breath becomes more fœtid; and the pulse more quick or rapid, and generally soft, open, and full, or weak. With the increasing severity of the accompanying fever, the disease extends to the throat, and even to the respiratory and digestive mucous surfaces, thereby occasioning great or very imminent danger.

9. This form of stomatitis may be confounded with the THRUSH, or with *mercurial stomatitis*, from which latter it may be distinguished by absence of the cause, and of the mercurial fœtor of the breath. It is more closely allied to the thrush, from which it differs chiefly in the larger patches of exudation at the commencement of the disease, in the more rapid and continuous extension of these patches, in the greater amount of fever and of swelling of the adjoining parts, and in the more advanced age of the children most frequently attacked, the thrush occurring generally, or oftenest, in much younger children than this form of stomatitis, commonly in infants during, or soon after, lactation.

10. Pseudo-membranous stomatitis may terminate in resolution, the swelling and redness diminishing, and the membranous exudations being either detached or absorbed; or it may pass into the chronic state; or it may go on to ulceration, or even to gangrene. The first of these terminations is the most frequent, the parts healing without leaving any cicatrix. But the affection is not infrequently chronic, usually after a more or less acute state. In the acute form, it often extends to the pharynx and respiratory passages, and sometimes also to the digestive mucous surface; and, when thus complicated, it generally terminates fatally. In the chronic state, it is usually limited to the mouth; and may continue for several weeks or even months.

11. Relapses are frequently observed in weak cachectic children, especially when confined in an unwholesome air, or crowded apartment. M. GUERSENT states that the cases of this complaint in the hospital for children in Paris are very subject to relapses.

12. *B.* The *causes* of pseudo-membranous stomatitis, are chiefly those which lower the constitutional powers, and impair the assimilating functions. This complaint may occur at any age, but it is most frequent during the second dentition, and during the evolution of the molar teeth. It is very rare during lactation, but becomes more frequent from the first year of age, until the second dentition is completed. It is observed chiefly in autumn and winter; and in these seasons especially, and not infrequently also in the spring, it is almost endemic in some countries, whose climates are cold and humid, and in districts subject to inundations. In these particularly it may even become epidemic.

13. The *predisposing causes* are whatever impairs the general health, as impure air, unwholesome food, insufficient clothing, and want of cleanliness; living in cold, low, and humid cellars; crowded apartments and sleeping-places; want of exercise in the open air; and privation of light and sunshine and of due ventilation. M. GUERSENT states that this form of stomatitis is almost endemic in the hospital for children in Paris, especially in the wards appropriated to ophthalmic, cutaneous, and scrofulous affections; and that boys are more affected than girls. It has been supposed to have been propagated by contagion, in circumstances favourable to this mode of communication; but the evidence of the possession of this property by this affection is not always conclusive, although cases have appeared to warrant a belief in the existence of it, especially when the disease is prevalent.

14. *C. Treatment.* — VAN SWIETEN advised the application of the hydrochloric acid in a proportion of honey, varying with the severity of the case (from one-fourth or one third to three-fourths of the former), by means of a small piece of sponge attached to a small stick, to the membranous exudations. But care should be taken that this application should extend as far as the exudation. Generally one or two applications in the twenty-four hours are sufficient. At the same time a terebinthinate embrocation, such as No. 296. or No. 311. in the *Appendix*, should be applied by means of flannel or spongeo-piline around the throat, or along the sides of the lower jaw. After a few applications of the acid and honey, or, in the intervals between the application of them, a

gargle or wash, consisting of the decoction of cinchona and hydrochloric acid, or any other astringent gargle, may be employed. In some cases I have found a varying proportion of borax and honey efficacious; and when the patients have been old enough to use a gargle, then a saturated solution of borax, in any suitable vehicle, has also been used. A strong solution of alum, or alum in fine powder, with acacia-powder or mucilage, has also been recommended by BRETONNEAU and others; whilst the nitrate of silver, in various states of solution, or even in substance, has been advised by many. More recently, the chlorides, especially the chloride of lime and the chloride of zinc, in varying grades of solution, according to the severity of the disease, or in the state of powder conjoined with other substances, have been severally prescribed by myself and others.

15. If the disease have advanced to simple or to phagedenic ulceration, the above means should be employed in more energetic or concentrated forms; and such other means should be used as will support the vital powers and resistance, and thereby change the morbid action locally. In all cases, indeed, but in these especially, internal and constitutional means ought to be appropriately prescribed. Some writers have advised the application of leeches to the throat or neck, &c. I have often been called to patients after recourse has been had to them, but I have rarely seen much benefit derived from them. I would not say that they should not be applied in the more sthenic cases, or in robust or plethoric patients; but these latter are rarely attacked by the disease; and, when they are, the employment of leeches for them is likely to be of service, especially when the applications to the mouth and the embrocations to the throat and neck, advised above (§§ 14.), are also duly resorted to. In most cases, the preparations of cinchona, with ammonia, or with the fixed alkalies, or with diaphoretics, as the liquor ammoniæ acetatis and spiritus ætheris nitrici, are beneficial, especially when the pulse is quick and soft, and the flesh is flabby or soft. In some it will be requisite to administer the most powerful tonics and stimulants, as the preparations of cinchona with hydrochloric acid and hydrochloric æther, tincture of serpentaria, &c.; and even to allow a sufficient quantity of wine in arrow-root or sago. The bowels should be freely opened by the usual means, or by equal quantities of castor oil and oil of turpentine, administered by the mouth, or in enemata, or in both ways, according to the urgency of the case. If the disease assume *a chronic form*, internal or constitutional means are always required; and of these means, change of air, especially to a warm and dry locality, is one of the most important and successful, especially when aided by an appropriate use of one or more of the remedies already noticed.

16. III. STOMATITIS MERCURIALIS — *Mercurial stomatitis* is one of the more common forms in which the poisonous effects of mercurials manifest themselves. It has, therefore, been described, and fully treated of, in connection with other injurious effects of mercury, in the article POISONS, from §§ 562. to 594. inclusive; §§ 568. 580—587. and 593., more particularly relating to mercurial stomatitis.

17. IV. STOMATITIS ULCERATA — *Ulcerated Stomatitis—Cancrum Oris* — may be an advanced stage of either simple stomatitis or of pseudo-membranous stomatitis. — *A.* It may also commence with inflammation of the external surface of one or more of the gums, most frequently of the lower jaw, and generally on both sides. With the inflammation, swelling and œdema are often very considerable; ulceration soon appearing over the alveolæ and near the teeth. The cheeks and face are swollen; the sub-maxillary glands are tumefied; the mouth is opened with great difficulty; and saliva with mucus fills the mouth, and prevents a satisfactory view of the diseased surface. A coppery, unpleasant taste is complained of, and a peculiar fœtor of the breath is remarked. Heat, tenderness, and swelling of the face increase, and ulceration extends over the gum, sometimes exposing the alveolar processes, and often to the cheeks, if the disease be not early checked. It may be stationary for some days, especially when partially controlled by treatment. In some cases more or less hæmorrhage takes place from the ulcerated parts. The febrile symptoms are generally of an asthenic or low character; the pulse being soft, weak, frequent, or small; and the skin cool or natural, excepting that of the face and neck; and the bowels confined or irregular.

18. This form of stomatitis is most frequently seen in children between the first and second dentition, after weaning, and during recovery from exanthematous fevers, especially from scarlet fever. It generally occurs in cachectic and debilitated subjects, and in the children of the poor, that are ill-fed, and live in low, close, and crowded and ill-ventilated apartments. It is not infrequently superinduced by disorders of the stomach and bowels, and should be viewed as a very serious malady, especially when it appears in the circumstances now mentioned, and more particularly when it occurs after scarlet-fever; the prognosis, however, should depend chiefly on the constitutional symptoms, especially when these are correctly interpreted, and upon the absence or presence of visceral complications.

19. *B.* A *variety* of ulcerative stomatitis sometimes occurs in adults, consecutively upon exhausting discharges, and as a sequela of other diseases. It occasionally appears in delicate females during lactation, and in the course of debility, or of debility conjoined with cachexia, produced by other depressing or exhausting causes. The disease in these cases usually commences with inflammation of one, seldom of both, sides of the tongue, and extends to the inside of the cheek. In some cases, one or more very small, hard, and painful sores first appear on the side of the tongue, which ulcerate, with hard and elevated margins, and are followed by a more extended inflammation; and in others these ulcers supervene upon previously existing inflammation. As the disease proceeds, the interior of the mouth appears red and inflamed, is very painful, and so tender, that fluids only, and these of the blandest kind, can be received into it. The tongue is red, smooth, or glossy, and a copious flow of saliva takes place from the mouth. There is at first neither loss of appetite nor fever; but as the affection extends over the internal surface of the mouth, cheeks, and tongue,

fever supervenes, and the stomach and bowels become irritable, the morbid irritation extending to the pharynx and along the œsophagus to the stomach and bowels; diarrhœa, emaciation, and extreme exhaustion, sometimes supervening, and even terminating in death. Drs. Hale, Backus, Wilson, and Holt, of the United States, have described this variety of stomatitis, and state that it occurs chiefly in women when suckling, or in an advanced stage of pregnancy. But it is not peculiar to them, cases of it occurring, on rare occasions, in the circumstances already stated, especially when debility is associated with more or less visceral disease.

20. *C.* The *Treatment* of ulcerated stomatitis should be mainly constitutional, means being used to improve the vital powers of resistance, and to prevent the extension of the local changes. The states of the excretions should be carefully ascertained, especially of the urine, and the treatment directed accordingly. In some cases, the treatment is beneficially commenced with an emetic of sulphate of zinc; and a purgative powder or draught, suitable to the state of the bowels and appearances of the stools, is often afterwards required. The decoction of cinchona, with muriatic acid, and muriatic æther, or with the nitro-muriatic acids, or with ammonia or the fixed alkalies, according to the state of the urine, is always more or less of service. It may be necessary to have recourse to wine in addition to these or other tonics, or to the sulphate of quinine given in the compound infusion of roses, &c. The bowels should receive due attention during the progress of the case; and the occasional administration of an enema containing oleum terebinthinæ will generally be of service, as respects not merely the state of the bowels, but also the system generally.

21. The local affection has too commonly been viewed as local merely — as simply inflammatory; and the inflammation has too frequently been considered as of an ordinary sthenic kind, instead of asthenic, and requiring very opposite means to those often employed. Because there have been swelling, increased redness, enlargement or engorgement of the adjoining glands, leeches have often been prescribed, and have either increased the mischief or have had no beneficial influence on the disease. Cold applications to the neck or the throat have not been of greater service. I have generally employed, with benefit, embrocations to these situations, consisting chiefly of the terebinthinated and camphorated forms prescribed in various parts of this work, and in the *Appendix*; and such applications or gargles to the affected parts, as the age and circumstances of the case suggested. When the patient can use a gargle, then the decoction of cinchona, with hydrochloric acid, or with hydrochlorate of ammonia, or with alum, or with tincture of myrrh, or of krameria: or strong tar-water; or various fluids containing creasote, or even the chloride of zinc, or of lime, in small quantities, may be severally tried, according to the peculiarities of the case, and the effects produced.

22. Washes, lotions, linctuses, &c., are likewise of great service, especially when the former are applied directly to the parts by means of a sponge attached to a small stick or piece of whalebone. Washes or lotions may contain either the nitrate of silver, or the sulphate of zinc, or the chloride of lime, or the chloride of zinc. When a linctus is preferred, then the substance should be such as may be passed into the stomach not only without danger, but with benefit. Thus a linctus may be prescribed, containing either the hydrochloric acid, or the oleum terebinthinæ, or the tincture of cinchona or of myrrh, or red wine, &c.; and when an emetic effect is desired, then the sulphate of zinc may be given in this way.

23. The *variety* of ulcerated stomatitis described by the American physicians as peculiar to pregnant and puerperal females requires also a restorative and tonic treatment. Dr. Backus advises, as local applications, mild astringent infusions, or a solution of nitrate of silver. Suckling in these cases ought always to be relinquished. Dr. Holt states that the disease has invariably yielded to iodide of potassium, given in doses of five grains three times a day, a cure having been obtained in a very few days, often in two or three. Dr. Wilcox says that he has met with uniform success from the decoction of *Polygonum punctatum* of Elliot, made by boiling an ounce of the dried leaves and tops in a pint of water for twenty minutes, and employed as a gargle almost hourly.

24. V. Stomatitis Phagedenica. — Synon. —*Cancrum Oris—Cancer Aquaticus—Stomacace Maligna — Noma — Gangrenous Stomatitis — Water-Canker—Sloughing Phagedena of the Mouth.*— This most dangerous and very often fatal affection presents, from the commencement, very different characters from those of the other forms of stomatitis. The gangrene or sloughing which occurs consecutively of the forms of stomatitis already noticed is merely an occasional termination of these, owing either to neglect, or to general cachexia, or to extreme exhaustion or depression of vital power: but this malady is primarily and idiopathically distinct from the gangrena oris — from the gangrenous terminations of the other kinds of stomatitis.

25. *A.* The *literary history* of phagedenic stomatitis is briefly as follows. The disease appears to have been noticed by C. Battus, a physician in Amsterdam, as early as 1620; and Vander Woorde soon afterwards designated it by the term *water-kanker.* Arnold Boot in 1649 described it by the names of *labrosulcium* and *cheilocace*, very probably confounding it with other forms of stomatitis. Van Rinoh assigned it the name of *scorbutic cancer*; and Van Lill called it *noma*, *ulcus noma*, and *stomacuce.* Callisen designated this malady *stomacace gangrenosa*; Lentin, *ulocace*, and Wendt, *sphacelus of the mouth.* Lund, a Swedish physician, saw eleven children with this malady, which he named *noma*, and of these ten died. Meza described it as he observed it in Denmark. Drs. Coates and Jackson met with it in the United States, the former calling it *gangrenous ulcer* of the mouth, the latter, *gangagræpsis*; but they probably did not distinguish between it and other forms of stomatitis. It has also been noticed by C. F. Fisher, Siebert, C. G. Hesse, Rust, Schmalz, Hildenbrand, Girtanner, Joerg, Reimann, Weigand, Hueter, &c. The most detailed accounts of the disease have been furnished by A. L. Richter, Guersent, Blache, Taupin, Rilliet and Barthez. The first of these has described three varieties of

this malady — 1st, the *noma scorbutica*; 2ndly, the *noma metastatica*; and 3dly, the *noma gastrica* — divisions which are more imaginary than real. The two last of these writers have adduced twenty-one cases of the disease; and, as well as M. Guersent, have appropriated much of what has been advanced by Richter. M. Taupin has described thirty-six fatal cases which occurred in the hospital for children in Paris.

26. *B.* The *symptoms* of phagedenic stomatitis are commonly swelling and hardness of one cheek or lip, — of the cheek most frequently, — without marked increase of heat or redness, and without much tenderness or pain, even on examination. Owing to the absence of acute or active symptoms at the commencement, the disease is often overlooked at first, or until it has made a dangerous progress. The tumefaction externally is, however, early attended by a waxy and glossy appearance, which is so characteristic as to direct the instant attention of the physician to the disease, although it may have been overlooked or unattended to by the friends of the patient. On examining the mouth little or no redness or mark of inflammation is observed; but, in the internal surface of the swollen part, an ash-coloured or whitish eschar or slough of small size may be detected in the centre of the cheek, or in the commissure of the cheek and lower jaw, surrounded by hardness and swelling. The tongue is pale, flabby, or slightly loaded; the gums are pale and spongy. There are more or less marked indications of debility, exhaustion, and cachexia, with languor and fretfulness. The pulse is generally small, soft, and quick; but without much increase of temperature, until towards evening. The evacuations are unhealthy and offensive

27. If the disease come under treatment at this early stage, a judicious treatment will frequently arrest its progress. But, as it advances from this stage, the danger increases. The slough or eschar on the inside of the cheek soon spreads, and even extends to the lips and gums; and is attended by a copious discharge of saliva, which is clear at first, but soon becomes turbid and mixed with mucus and a sanious matter. The breath is now very offensive. As the gangrenous disorganisation thus extends, the external appearances indicate the invasion of the integuments about the centre of the tumefaction. A vesicle or a pale or ashy spot appears in this situation, and soon becomes livid and sloughs. The discharge from the diseased parts is now remarkably contaminating and corroding, the lower lip, the angles of the mouth, and the alveolar processes, being not infrequently destroyed by it. The teeth often fall out, with dead portions of the alveolæ; and, if death does not previously occur, both sides of the face may become affected, or the gangrene may extend to all the soft parts of the mouth and face, and even to the maxillary, the palatal, and the nasal bones.

28. As the malady thus proceeds locally, the constitutional symptoms are chiefly those of increasing vital depression and contamination of the circulating fluids. The cachectic indications are more and more apparent; the pulse more rapid, feeble, and small; and the bowels, which at first were confined, generally become much relaxed and extremely offensive. The urine is offensive, alkaline or phosphatic, or soon becomes ammoniacal. The general surface is usually cool; the extremities become cold; and life gradually, but quickly, ceases. From an early period, the disease may be *complicated* with more or less internal disease, more especially with latent or congestive pneumonia, or with an asthenic gastro-enteritis; but these are only contingent or occasional associations.

29. *C.* The *diagnosis* of phagedenic stomatitis is, from the commencement, sufficiently evident. The hard, indolent swelling, and the peculiar glossy or waxy appearance of its outer surface, and the small slough in its internal surface, are quite characteristic of this malady.—The *prognosis* should be unfavourable or stated with great caution from the first. If the disease be seen at the early or œdematous stage, and be treated in, or can be removed to, a wholesome situation, a judicious treatment may arrest its progress; but if gangrene be established, although recovery may take place, disfigurement cannot be prevented; and if sloughing and the constitutional symptoms have advanced and are severe, recovery cannot be expected. When the disease appears in hospitals for children the issue is generally fatal.

30. *D.* The *causes* of phagedenic or gangrenous stomatitis are those already noticed, as occasioning the other forms of stomatitis, more especially pre-existent cachexia, depression of vital power, or exhaustion by previous disease, by exanthematous fevers, by protracted disorder of the pulmonary, the digestive, and assimilating organs, and by living on unwholesome and insufficient food. Low, cold, and humid apartments, particularly cellars, ground floors, &c., are also not infrequent concurrent causes of the disease. The specific action of mercury may favour or more directly occasion it, although it more frequently appears independently of this mineral, and when none of its preparations have been taken. It occurs chiefly between the ages of two and nine years, but most frequently from three to six years of age. The air of hospitals for children is most commonly productive of this malady; and, when treated in the wards of these hospitals, recovery rarely takes place. M. Taupin has seen thirty-six cases in the hospital for children in Paris, and they were all fatal.

31. *E. Treatment.*—Prompt and decided measures are required for this form of stomatitis. The patient should be removed into a dry, warm, and well-ventilated apartment, and the causes of the disease as far as possible avoided. The state of the cheeks and mouth should be very carefully ascertained, and means appropriate to the existing changes instantly applied. If no slough have as yet appeared in the interior of the cheek, the terebinthinate embrocation (§§ 14. 21.) should be applied externally, and the internal surface be washed by a lotion of strong tar-water. If the latter cannot be readily obtained, one part of oleum terebinthinæ ought to be mixed in three of honey, and applied to the inside of the cheek and gums twice or thrice daily. In some cases I have given a warm stimulating emetic of sulphate of zinc, and a small quantity of capsicum, with marked advantage, and subsequently a stomachic aperient draught, the operation on the bowels having been promoted by a terebinthinate enema. During the treatment of the early stage of the malady, the decoction of cinchona, with muri-

atic acid and æther, or with ammonia, or with chlorate of potash, or the quinine or other tonics, as advised above (§§ 20.), should be given at duly regulated periods, between the administration of suitable nourishment.

32. In a further advanced stage, when a slough has become very manifest in the mouth or cheek, the part ought to have solid nitrate of silver, or strong hydrochloric acid, applied to it, the surface being frequently washed by the lotions already mentioned, or by a strong solution of nitrate of silver, or muriate of ammonia, or with washes containing the chloride of lime, or of zinc, or creasote, with camphor and myrrh. These latter will tend to arrest the sloughing, will correct the fœtor, and will counteract the contaminating influence of the discharge from the diseased part. During this period, cinchona and other tonics, in combinations already mentioned, should be prescribed; and beef tea, with rusks; the yolks of eggs, with wine or brandy; turtle soup, and other nourishing, digestible, and restorative articles ought to be freely supplied. Instead of wine, or in addition to it, in the more extreme cases, the mistura spiritus vini Gallici may be administered in doses suitable to the age of the patient. From 1821 until 1825 or 1826 I frequently had recourse to the chlorate of potash in this and in other asthenic diseases, at the Infirmary for Children. But I seldom found it of great service when given alone at advanced stages of these maladies. It was, however, often prescribed in conjunction with other remedies, with much benefit, and especially in the forms stated in early parts of this work— with the decoction and compound tincture of cinchona, or with cascarilla, camphor, &c.

33. When sloughing has made still further progress, the local means already advised ought to be more frequently employed, and in more concentrated forms. Turpentine mixed with honey, in equal quantities, or thickened with liquorice powder, should be applied to the part, and if the external surface of the swelling become livid, the same application ought to be made to it; or an incision should be made into it, and the incised part frequently injected with either of the lotions or washes already mentioned. MM. BARON, BILLARD, and others, have recommended the actual cautery, at a white heat, to be applied to the incised part. Of this last I have no experience and little hope. The other means I have found successful when the constitutional powers have been duly supported, and when the disease had not advanced to a hopeless condition before medical aid was obtained. When great irritability and distress have appeared in cases of this malady, I have generally conjoined some preparation of opium with the local means, and prescribed it internally with camphor and other remedies, having due regard to the age of the patient, and directing it with much caution at an early age.

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STOMATORRHAGIA. — *Hæmorrhagia Oris.* — *Hæmorrhage from the Mouth.* — See art. HÆMORRHAGE, §§ 85, *et seq.*

SUCCUSSION.—SYNON.—*Succussio;*—*Secousse, Succussion*, Fr.;—*das Schütteln, die Orschütteln*, Germ.;—*Hippocratic Succussion of the Trunk.*
CLASSIF.: —GENERAL PATHOLOGY—SEMEIOLOGY.

1. *Succussion of the trunk* of the body was mentioned by HIPPOCRATES in several parts of his works, and was employed by him to ascertain the presence of purulent and other fluids in the cavities of the chest. MORGAGNI, in noticing this mode of diagnosis, admitted its frequent failure, but in such a way as evinced his ignorance of the circumstances to which failure is owing. LAENNEC first clearly demonstrated the conditions upon which the evidence furnished by succussion depends, and since his time this mode of investigating diseases of the chest has been resorted to whenever they have been supposed to have been attended by effusion of fluid into the thoracic cavities. It is chiefly in *pneumathorax* that succusion produces the *sound of fluctuation* in the pleural cavity, for it is necessary to the production of this sound that, along with the fluid, more or less air should also be present.

2. *Succussion* is performed, as recommended by HIPPOCRATES, by seizing both shoulders of the patient, whilst he is seated, and, having applied the ear to the side of the thorax, by jerking the trunk, or by abruptly turning or shaking the trunk, a sound resembling the splashing or fluctuation of water is then heard, if a fluid and air be contained in the cavity. If the cavity contain no air, although filled by a liquid, no sound will be produced, for the collision of the fluid with air is requisite to the production of sound, and the greater the quantity of air the more distinct will be the sound of fluctuation or splashing. Care should be taken, during this mode of investigation, to distinguish between the sound of fluctuation produced by succussion in the stomach, when this organ contains much air and liquid, and that which is produced in one of the thoracic cavities. A mistake will be prevented by the slightest attention, for the seat of fluctuation is generally easily manifested. In many cases, the patient

himself can perform succussion; and it is often useful to cause him to perform it whilst the physician applies his ear to the presumed seat of effusion. Succussion is useful chiefly in the diagnosis of pneumo-hydrothorax or pneumathorax. (See art. PNEUMATHORAX, § 17.)

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SUPPURATION.—See arts. ABSCESS and INFLAMMATION, §§ 44, *et seq.*

SYCOSIS. — SYNON. — *Sycoma; Sycon*, *Sycosis* (*from συκον, a fig*);—*Mentagra*;—*Ficus*;—*Sycosis menti*;—*S. barbæ*;—*Mentigo*;—*Varus Mentagra*;— *Phyma Sycosis*;—*Roseola ficosa*; — *Dartre pustuleuse mentagre*, Fr. — *Barber's Itch*: — *Chinwelk*;— *Whelk.*

CLASSIF.—IV. CLASS, IV. ORDER (*Author, in Preface*).

1. DEFIN.—*A chronic pustular eruption, either scattered singly, or clustered, over the chin, upper lip, or lateral parts of the face; the pustules being pointed and seated chiefly in the hair-follicles and connected tissues, and being sometimes propagated by contagion.* (See art. SKIN, § 78.)

2. i. DESCRIPTION.—This chronic eruption of the skin appears chiefly on the hairy parts of the face; and sometimes on the nape of the neck, and much resembles acne. It seems to be developed in the hair-follicles and sebaceous glands, and their connected tissues, giving rise to conical elevations, which become pustular. The pustules are generally traversed by the shaft of a hair; are of a pale yellow colour. Their evolution is usually attended by a sense of heat and tension of the affected parts. When *disseminated* they appear as very small red points, which gradually become more prominent, until about the third day, when their tops become white, and soon afterwards are filled with a yellowish pus. These pustules seldom much surpass the size of a millet-seed. From the fifth to the seventh day each pustule bursts spontaneously; its sides shrink, and a slight oozing takes place, producing a brownish crust, which is very slightly adherent, and passes at its edges into the epidermic exfoliation from the inflamed surface immediately surrounding the pustule.

3. When the pustules are *clustered* or grouped in numbers the inflammation then extends to the subjacent cellular tissue, and occasions small, hard, and red inflammatory tumours, covered with pustules, or incrustations of considerable thickness, and of a mixed yellowish and greenish-brown hue. Most frequently, sycosis appears, like rosacea, in repeated partial eruptions, succeeding each other at irregular intervals. When the pustules break out repeatedly on the same places, the inflammation of the subjacent tissue occasions indurations and thickenings, which, with similar changes in the corion, present the appearances of large tubercles. These are most frequently observed in aged, cachectic, or leuco-phlegmatic persons, in whom resolution of the pustular inflammation is imperfect. When the eruptions have been extensive, or have succeeded each other rapidly, these tubercles increase in number, and spread over the skin or other hairy parts of the face. The pustules which continue to be evolved on the surfaces of these tubercles, or in the intervals between them, evince the nature of the affection. This advanced state of the eruption — this admixture of pustules, tubercles, and incrustations, imparts a disgusting appearance; and at this stage, sycosis is always obstinate, a cure being never obtained but with great difficulty.

4. Sycosis may be confined to the upper lip; the agglomeration of pustules on this part occasioning a thick brownish or blackish scab, greatly elevated above the surface. When the disease is prolonged or extensive, the skin often becomes much altered by it, and so swollen in parts as to appear covered by moist and vegetating tumours. The bulbs of the beard often participate in the inflammation, and the hair falls out; but subsequently, when the disease is cured, lighter and weaker hair is reproduced, and acquires greater strength. In very chronic and severe cases, the loss of portions of the beard is permanent.

5. When the disease yields to treatment, new pustules cease to appear; the incrustations are detached, and the tubercles or small tumours decline in hardness and size. Slight desquamations occasionally take place from the points formerly affected, which continue for a long time red or livid, especially in cachectic habits and aged persons, and in these particularly the affected parts retain their thickened and tuberculated appearance through the rest of their lives.

6. The *duration* of this eruption is never less than one, two, or three months: it often continues for years, notwithstanding the most rational treatment; and is apt to recur, after having been cured, in persons of faulty constitution, in those advanced in age, and after errors in diet and regimen. The continuance or recurrence of the causes of the eruption tends also either to prolong or to reproduce it.

7. ii. DIAGNOSIS.—The conical form of the pustular elevations, the bright red of the bases, the deep-seated connection of the pustules, and the purplish and indolent tubercles which succeed them, are characteristic of this eruption, which, however, may be mistaken for acne, ecthyma, impetigo, boils, and syphilitic eruptions. The situation and the relations of the pustules of sycosis to the hair distinguish them from *acne*. The pustules of *ecthyma* are larger and more highly inflamed than those of sycosis. The scabs following ecthyma are also broader, thicker, and more adherent, and are unconnected with tubercular elevations and indurations. The small pustules of *impetigo figurata* hardly rise above the level of the surface, and are not pointed like those of sycosis; they also differ from the latter in the greater rapidity of their evolution, and the more acute symptoms attending their progress. Although both these pustular eruptions may be disposed in groups, those of sycosis are most frequently isolated and distinct, whilst those of impetigo *figurata* are generally clustered. The pustules of the latter burst on the third or fourth day, and the fluid from them is quickly changed into continuous yellowish incrustations, which increase in thickness in the course of a few days. Those of sycosis, on the contrary, do not burst until the fifth, sixth, or seventh day, and the scabs which succeed are thin, slight, and isolated. All

these features are, however, obscured when the pustules of sycosis are copious and extensive, and give rise to a pale yellowish-green secretion, or when sycosis is severe and acute, and the pustules confluent or crowded; but even then, the thickening, swelling, and induration of the sub-cutaneous cellular tissue and corion, imparting a tubercular character to the affected part, will prevent any mistake. In *furuncle* the inflammation commences in the cellular tissue and extends to the skin, much pus and a sloughy core being expelled through an opening which leaves a scar. But in sycosis the inflammation first affects the hair follicles, and the pustules discharge only a small quantity of pus by a minute opening, which is speedily effaced without leaving a scar.

8. *Syphilitic pustules* very rarely are confined to the lower or hairy parts of the face. They most frequently appear on the alæ of the nose, forehead, and near the angles of the mouth. They are much flatter than those of sycosis, and instead of arising from bright red bases, as the latter do, they spring from coppery, dirty and almost flabby bases; and they are not preceded by the smarting or painful tension ushering the eruption of sycosis. The tubercles of sycosis may be more readily confounded with the tubercular syphilitic eruption; but those of the former are more conoidal, their bases are seated more deeply, whilst the syphilitic are more rounded, have a shining appearance, and are more superficial. They are, moreover, primary in their formation, whilst those of sycosis are consecutive of the pustules. The syphilitic eruptions are also preceded and attended by a variety of other morbid phenomena, which further serve to distinguish them, as sore throat, inflammation of the conjunctivæ, nocturnal pains, &c.

9. iii. The PROGNOSIS of sycosis is most uncertain; for it is impossible to state with certainty the period of its duration; and even when the decrease of the eruption and the appearance of the affected parts promise a speedy cure, fresh pustules often break out, without any apparent cause. In other cases, when the extent and severity of the eruption lead to the expectation that the disease will prove most obstinate, an active and judicious treatment may remove it in a comparatively short time. M. RAYER considers that those cases generally] prove the most rebellious which, in the chronic state, preserve the pustular and primitive form.

10. iv. CAUSES.—The contagious nature of sycosis has been contended for by some writers, and denied by others. PLINY states that the disease, which he described by the name of *Mentagra*, spread in Italy by contagion. If this disease was actually not sycosis, it was very closely allied to it. M. FOVILLE states that he has seen several of the insane patients in the hospital of Rouen successively attacked with this affection from having been shaved with the same razor. Admitting the disease to be contagious, circumstances cannot often favour such an occurrence, especially in such a manner as will demonstratively manifest the fact. Sycosis most frequently appears in adult males (very rarely in females) of a sanguine or bilious temperament, who have thick and strong beards; and occasionally among the aged, more especially among those who have been habitually used to strong heats, as cooks, founders, refiners, and workers in glass and metals. The abuse of spirituous liquors, indulgence in the luxuries of the table and highly-seasoned food, and similar causes, have been supposed to occasion it; but these may more rationally be considered as causes which concur to perpetuate it, or to render it more remarkably chronic than to originally produce it. The want of due cleanliness, irritating applications to, or rancid matters allowed to remain in contact with the parts affected, the use of a foul, or blunt, or rough-edged razor, are much more likely to excite this eruption than those other causes to which it has been sometimes imputed. It appears more frequently in spring and autumn than at other seasons.

11. Dr. GRUBY, of Vienna, has lately contended that favus is occasioned by a vegetable formation, and that such a formation, of the cryptogamic kind, is found in the roots of the hair of the beard in this affection, and around that portion which is contained in the hair-follicle. The seeds of this vegetable formation, for which he proposes the name of *mentagrophite*, he believes to be the source of the contagious nature of the disease. On examining this affection with the microscope, the scales appear to be composed of epidermic cells, but the whole of the dermic portion of the hair is surrounded by cryptogamic formations, which constitute a vegetable sheath around it, in such manner, that the hair may be likened to the finger surrounded by a glove. These cryptogamia never rise above the surface of the epidermis: they originate in the matrix of the hair and in the cells of which the follicle is composed, and they ascend so as to surround all that portion of the hair included within the dermis. "They present everywhere a prodigious number of sporules, which are adherent on the one side with the internal surface of the follicle, and on the other with the cylinder of the hair: to the former they are very closely connected. Each plant is composed of a stem of several branches, and of sporules."

12. v. TREATMENT.—The causes, both exciting and concurring, should be removed; and the hair cut close with curved scissors, particularly if the use of the razor aggravate the affection. In some cases an emetic will be given with advantage, but it should be followed by stomachic purgatives. If the local inflammation be considerable, leeches may be applied; and if the patient be plethoric, a general blood-letting may precede them. Local emollient applications should be first employed, and these ought to be followed, especially as the disease becomes chronic, by applications which contain the chloride or bichloride, or the proto-nitrate, of mercury, in the form either of ointment or lotion. Ointments containing the iodide of sulphur, or the iodide of potash and sulphur, or even sulphur only, are most successful, especially when emollient applications, or vapour douches, or warm water douches, are used in the intervals between the employment of these ointments. In some cases a restorative or tonic constitutional treatment is required, and alterative mineral springs and waters are often of service. The hair, especially when it becomes loose, should be removed from the seat of eruption; and, if the affection become very chronic and obstinate, the application of the mineral acids, or of the caustic alkali, or the nitrate of silver, or even of the chloride of zinc, may severally be tried. Great care should be taken, in

this affection, as well as in others, for which ointments may be required, that they are recently made. In a case to which I was lately called, the zinc ointment was prescribed after the use of emollient applications, and was found quite rancid and most injurious *at five different chemists'* in the outskirts of the town where it was had; but when this ointment was procured from a respectable chemist in town, it was quite successful.

Biblioq. and Refer. — *Celsus*, De re Medica, L. vi. cap. iii. — *Plinii Secundi*, Natur. Hist. L. xxvi. cap. i-iv. — *Ætius*, Tetrab. i. serm. 5. cap. 80. 190. — *Pauli Æginetæ*, lib. ii. cap. 22. — *C. Johrenius*, De Mentagra, 4to. Franc. 1662. — See the Works of *Willan*, *Bateman*, *Rayer*. *Plumbe*, *E. Wilson*, and others referred to in the several Articles on Chronic Cutaneous Affections, and especially in that on the *Pathology of the Skin*.

SYMPATHY AND SYMPATHETIC ASSOCIATIONS OF DISORDER. — **Synon.** — **Morbid Sympathies.** — *Συμπαθια* or *συμπαθεια*, (from *συν*, with; and *παθεω*, I feel or suffer; or *παθος*, feeling, affection, suffering); — *Sympathia*, Lat.; — *Consensus nervorum*; — *Partium Consentio*, Auct.; — *die Mitempfindung*, *Sympathie*, Germ.; — *Sympathie*, Fr.; — *Simpatia* Ital.; — *Morbid Sympathies*.

Classif. — **Physiological Pathology**; — **General Pathology**; — **Semeiology.**

1. **Definit.** — Sympathy cannot be more correctly defined as it has been by Dr. **Klein Grant**, as follows: — "*That relation of the organs and parts of a living body to each other, whereby an action excited in one part, induces a corresponding action in another part.*"

2. **Baglivi** attributed the sympathies to membranous connection; **Bordeu** to the cellular tissue; **Willis** and **Vieussens** to the agency of the nerves; and **Whytt** and **Broussais** chiefly to the brain. **Rega** divided the sympathies into those of sensibility and those of contractility — a division which has much to recommend it. **Bichât** made some excellent observations on the relations subsisting between the sympathies and the different parts of the nervous system; but, although these observations were calculated to lead to a more correct arrangement of the sympathies than had formerly been offered, they have not yet produced this result. The writings of **Unzer**, far in advance of their age, had previously furnished much that was calculated to increase our knowledge of sympathetic phenomena; but this was physiological rather than pathological, and without sufficient practical application. **Bichât** appears to have been ignorant of the works of **Unzer**. Contemporaneously with the former, **Prochaska** examined physiologically sympathetic phenomena, when treating of the sensorium commune and the consensus nervorum, in his treatise on the Functions of the Nervous System, and, whilst he recognised what had been done by **Willis**, **Whytt**, **Stahl**, **Unzer**, and others, explained the phenomena by means of the sensorium commune, to which he referred the consensus nervorum.

3. In 1824, I defined sympathy to be, *that state of an organ or texture having a certain relation to the condition of another organ or texture, in health and disease*; or, *a related state of the vital manifestations or actions in different organs or textures, as, when one part is excited or affected, others are likewise affected or disordered.* I then classed sympathies into the *reflex* and the *direct*; the former taking place through the instrumentality of the sensorium, the latter being independent of it, and occurring through means of the ganglial nerves, and chiefly of those which form communicating chords between the viscera and of those which are distributed to the blood-vessels.

4. Subsequently Dr. M. **Hall** referred many of the phenomena usually ascribed to sympathy, especially those which I denominated reflex, to a reflex function of the spinal chord, which function he considered to occur independently of the brain, or even of the sensorium, that is, supposing the sensorium to be seated in the brain. But, that the sensorium commune is actually seated only in the brain, has been, and still is, doubted. **Willis** considered that there is a rational and a corporeal sensorium; and **Unzer** long subsequently adopted the same idea, or nearly the same idea; which was more fully developed and modified by **Prochaska**. This last writer subdivided this principle into two elements, namely, the sensorium commune of the soul, which is seated in the brain only, and reflects those impressions of which we are conscious, and the sensorium commune of the body, which is seated in the brain, spinal cord and ganglia and plexuses of the sympathetic system. But, wherever seated, there is evidently only one sensorium commune, which takes cognizance of impressions, and reflects them to distant parts, or, by means of which impressions, movements, &c., become sensations, or objects of consciousness or sentient operations, whether lively or faint, thereby constituting the class of reflex sympathies attended by consciousness. That this great principle may be seated in the basilar or central parts of the brain and medulla oblongata is very probable; but that it extends also to other or more distant parts and is independent of these centres of conscious or sentient actions, are not so admissible; for it is more reasonable to infer that those movements or actions which are unattended by consciousness, may be the results of a direct consensus of nervous action, or of a reflected consensus from ganglial or subordinate nervous centres, that either is not conveyed to, or does not reach the seat of conscious sensations, or which, owing to the state of this principle, or of its seat, fails to excite, rouse or effect it.

5. It is obvious that, if we attempt to arrange those sympathies which depend upon a consensus of the nerves, the classification must be made either independently of any reference to consciousness, or with so strict a regard to this principle as to assign to it a higher attribute than that which a simple nerve-action involves. If, however, we neglect such reference, any arrangement of nervous sympathies must be imperfect; and if we pay due regard to it, the difficulty of classification is greatly increased, seeing that the simplest and most direct consensus, such as those which concern the ganglial nerves, and which ordinarily occur independently of sensation, may become objects of the most intense sensation, the same change also taking place in respect of reflected sympathies, which may or may not be attended by consciousness, according to the intensity of the cause producing them, or to the state of the sensorium or of its seat. Hence it may be preferable to arrange sympathies with reference

to the superadded attribute of consciousness, but not to assign an order of sympathies alone manifesting this attribute or principle, seeing that there are few or no nervous sympathies, which may not, by intensity or otherwise, be attended by it, or excite it. Conformably with this view, therefore, I have offered the following arrangement, which I have more fully developed in the sequel — 1st, *direct sympathies*, transmitted directly either by nervous communications, or by continuity of structure, &c.; 2nd, *indirect or mediate sympathies*, conveyed by vascular communication, by states of the fluids, &c.; 3rd, *reflected sympathies*, curring through the media of the several orders of the nervous system, with or without consciousness.

6. From the time of WILLIS until those of UNZER and PROCHASKA, sympathy and consensus of the nerves were generally viewed as synonymous; and this consensus being supposed to depend upon the sensorium, it became a great difficulty to explain how this consensus took place with consciousness in some cases, and without consciousness in others. It was therefore inferred, that the consensus which involves this principle, takes place in the brain, and excites or impresses the mind or soul; and that the consensus which fails of impressing the mind, is seated throughout the frame in the several parts of the nervous system; the former being the mental consensus, and depending upon a mental or soul sensorium, the latter being a corporeal consensus, and depending upon a bodily sensorium. Thus these physiologists divided the sensorium into two essences or manifestations, the one with, and the other without consciousness, the latter, however, being only nerve-action, or the vital manifestations of the nervous system, which are unattended by consciousness, and which constitute an important, indeed the most extensive and important, part of those phenomena, which are comprised under the head of morbid sympathies.

7. The subject cannot be better illustrated, nor the observations I intend to offer on sympathy better introduced, than by adducing the remarks of PROCHASKA respecting it; and these cannot be more clearly conveyed, than in the words of Dr. LAYCOCK, who has most ably translated and edited the dissertation of this writer on the Nervous System, for the *Sydenham Society*. "That point of the nervous system is termed the common sensorium (*sensorium commune*), in which external impressions meet, and from which internal impressions are diffused to all parts of our body; in which, consequently, the consensus of the nerves takes place that is necessary to life, and in which external impressions are reflected into internal impressions, according to the law of self-conservation, with or without consciousness.

8. "That sensorium in which impressions are reflected with the consciousness of the soul, may, be termed the soul-sensorium; and the other, the corporeal sensorium; just as WILLIS has already divided it, into the rational and the corporeal soul.

9. "The brain, only, is the seat of the soul sensorium; the seat of the body-sensorium is the brain, spinal cord, and (as all observation shows) the ganglia and plexuses of the nerves. That external impressions can also be reflected in the brain, without consciousness, is shown by the involuntary convulsions of voluntary muscles. Monsters, born without brain and spinal chord, and which live up to the moment of birth, show that the consensus of the nerves necessary to this form of life, imperfect though it be, may take place, and that there may be a corporeal sensorium independently of the brain and spinal chord, and which, consequently, must be constituted by the plexuses and ganglia of the nerves. The movements observed to take place on irritating the nerves of a headless frog, and seen also in decapitated men, prove the same thing. The sympathetic nerve appears likewise to reflect its impressions in its ganglia and plexuses without the consciousness of the soul.

10. "In accordance with this consensus of the nerves, as well in the brain as in the spinal chord, ganglia, and plexuses, the operation of a stimulus is not limited to the nerves immediately irritated, but is extended to distant nerves, in known or unknown connection with the irritated nerves; and this is demonstrated by innumerable examples of consensus of nerves (consensus nervorum), as, for instance, the irritation in the pregnant uterus often causes nausea, vomiting, headache, toothache, &c.

11. "Both the soul-sensorium and body-sensorium operate according to the law of self-conservation, a truth which may be illustrated by numerous examples. For instance, the irritation or impression of too strong a light goes to the optic nerve, from whence it can only get at the ciliary nerves through the brain, and induce contraction of the pupil, so as to exclude the too vivid light from the eye, and obviate its unpleasant impression."

12. By most writers the term, consensus nervorum, has been viewed as synonymous with those nervous sympathies which occur in healthy persons, or which are not essentially morbid; whilst sympathy, according to its etymology, is considered by many as applicable only to associated morbid phenomena. The word *sympathy* has been viewed in both lights, and however correct the one may be, the other being the reverse, I shall respect common usage as regards it, and in order to prevent any misapprehension, use frequently the prefix, *morbid*, when discussing its numerous manifestations.

13. In attempting to illustrate *morbid sympathies, or those associated states of disorder which most frequently present themselves to the physician*, I shall first endeavour to classify them, conformably with the view above stated (§§ 5. 12.); and afterwards proceed to notice those which come more prominently before the medical practitioner, as fully as the plan and limits of my undertaking will permit. Many topics can be only briefly and imperfectly considered, whilst others may be barely enumerated, and offered to the reader, or to future inquirers, more fully to discuss or to illustrate.

14. ARRANGEMENT OF MORBID SYMPATHIES OR ASSOCIATED DISORDERS.

i. Definition of sympathies.
ii. Preliminary anatomical and physiological observations.
  A. The great extent and importance of the ganglial or the organic nervous system.
  B. The connections subsisting between the organic and cerebro-spinal nervous systems.

I. Inquiry into the Media by which Sympathetic and Symptomatic Phenomena are evolved, and Morbid Conditions are associated.

i. *Direct or immediate sympathies.*

A. Direct communications by means of ganglial nerves.

B. Influence of ganglia on different organs or parts.

C. By direct communications by means of the cerebro-spinal nerves of sense and motion.

D. By continuity of surface or tissue.

E. By contiguity of organs and structure.

ii. *Indirect or mediate sympathies.*

A. By vascular communications.

B. By states of the circulating fluids.

a. The chyle and other absorbed fluids.

b. The blood.

C. Owing to the conditions of the secretions and excretions.

a. By the various secretions.

b. By the excretions.

iii. *Reflected sympathies.*

A. Reflected from nervous ganglia, often attended by spasm and altered sensibility of involuntary parts.

B. Reflected through the media of the ganglionated roots of the spinal nerves, and affecting the movements of voluntary parts.

C. Reflected through the medium of the spinal chord, and inducing morbid sensations or motions, or both.

D. Reflected through either the medulla oblongata or the brain, or both, and causing various disorders of sensation, of perception, and voluntary action, &c.

II. Circumstances influencing the Character, Number, and Intensity of Sympathetic Phenomena.

i. *Race and temperament.*

ii. *Habit of body.*

iii. *Sex.*

iv. *Age.*

v. *Physical power.*

vi. *Occupations*, &c.

III. Classification of Morbid Sympathies, or of Symptomatic or Associated Disorders.

i. Associated Affections of Digestion and Assimilation.

A. *Disordered states of digestion and of assimilation associated with each other.*

a. Associated disorders of the stomach and liver.

b. Associated disorders of the liver with the intestines.

B. *Morbid sympathies between the digestive organs, and the secreting and excreting functions.*

a. Between the functions of digestion and the urinary functions.

b. Between the digestive functions and the skin.

c. Between the functions of digestion and fæcation.

C. *Sympathies between the digestive and the circulating and respiratory functions.*

D. *The sympathetic and symptomatic relations between the digestive organs, the brain, and the organ of sense.*

E. *Sympathies between the functions of digestion and locomotion.*

F. *Associated disorders of the digestive and the sexual organs.*

ii. Sympathetic and Symptomatic Phenomena connected with the Circulating and Respiratory Functions.

A. *Mutual influences of these functions.*

a. From nervous connections.

b. From the nature of the functions themselves.

c. From their actions on, and the reactions of the blood.

d. From physical agents acting on the blood and on the respiratory and circulating organs.

e. From mechanical and other impediments to the circulating apparatus.

f. Influences of these functions, and their symptomatic relations in acute diseases.

g. Symptomatic relations of these functions in chronic diseases.

B. *Morbid sympathies of the circulatory and respiratory functions with the digestive functions.*

C. *Sympathy between the vascular and respiratory functions, and the brain and organs of sense.*

D. Associated morbid states of circulation, secretion, and excretion.

E. Association of disordered excreting function, with disorder of the vascular, nervous, and muscular systems.

iii. Associated states of Disordered Sensation and Sensibility.

A. *Sympathetic and symptomatic states of the several senses.*

a. With the functions of digestion and excretion.

b. With states of the brain and spinal chord.

B. *Sympathetic relations of sensibility.*

a. With the organic functions.

b. With states of the cerebro-spinal centres.

c. With the reproductive organs.

iv. Associated Affections of Voluntary Motion.

A. *Sympathy between the functions of sense and locomotion.*

B. *Associations of mental emotion and locomotion.*

a. Arising from the exciting emotions.

b. From depressing emotions.

C. *Sympathies between organic and animal or voluntary motions.*

a. Organic or involuntary motions extending to voluntary muscles or organs, and rendering the actions of these involuntary.

b. Voluntary motions affecting the organic or involuntary actions.

c. Associations of the organic and voluntary motions in the functions of reproduction.

v. Sympathies of the Organs of Reproduction.

A. *Sympathies between these and the digestive and assimilative functions.*

B. *Between the several organs and the cerebro-spinal functions.*

a. Between these organs and the brain.

b. Between these and the spinal chord and voluntary organs.

C. Between these organs and the functions of sense and general sensibility.

vi. CONCLUDING REMARKS.—As to the importance of observing closely sympathetic and symptomatic phenomena, and of tracing their origins and relations, with reference not merely to diagnosis, but also to prognosis and treatment.

15. A due recognition of morbid sympathies, or of those associated states of disorder which most frequently present themselves in practice, of the media of their connection, of the modes of their supervention, and of their extent, is of the greatest importance to the physician in enabling him to form a correct diagnosis and prognosis in most of the diseases which come before him, and to arrive at rational indications of cure.

16. i. DEFINITION. — *Morbid sympathies may be defined to be associated states of disordered function, or of diseased action; the disorder or disease of one system, or organ, or part, affecting other systems, organs, or parts, according to their organic connections, their functional relations, and their several tendencies, or acquired or constitutional predispositions; the consecutive sympathetic disturbance often being more prominently manifested than the original or efficient morbid condition, and thereby frequently concealing or masking this condition.*

17. ii. PRELIMINARY OBSERVATIONS. — It is necessary to a due consideration of this subject, that, before I proceed to notice the more remarkable morbid associations occasionally presenting themselves in practice, I should take *an anatomico-physiological view of the media or channels by which one organ or part sympathises with, or becomes affected by, the morbid conditions of another organ or part.*

18. The modes of explaining these morbid associations or sympathies, adopted by previous writers, are various and unsatisfactory, and have been generally based upon the prevalent doctrines of the day; consequently the recognition of sympathetic, symptomatic, or associated morbid states, has been imperfect, the classification of them arbitrary or conventional, and the chains of connection existing between them imperfectly or erroneously traced.

19. Dismissing, therefore, all reference to the few writers who have considered the subject, I shall view it conformably with the inferences at which I have arrived, from researches which have engaged my attention on various occasions during the last thirty years.[*] But I can only imperfectly accomplish my intention within the limits to which I am confined, and must merely touch on certain points, which, to do them justice, would require a much more extensive elucidation.

20. *A.* There are certain circumstances in the *anatomy of the organic nervous system*, which, when kept in recollection, serve remarkably to explain many phenomena hitherto imperfectly accounted for. Much difficulty and misapprehension, in tracing the connexion of the sympathetic or associated morbid states, have arisen from the usual modes of viewing the large nervous masses, as giving origin to the nerves, or as being themselves a congeries of ganglia of a peculiar constitution. It would be much more conformable with a comprehensive view of the nervous system through the various grades of animal organisation, and with the development of this system in the more perfect animals, if the nerves, and especially the sensory and those of organic life, or ganglial nerves, were viewed as originating in the several tissues or structures themselves, more particularly in the organs of sense, in the cutaneous and mucous membranes, in the serous and fibrous tissues, &c. This idea, entertained and published by me many years ago, subsequent observations and reflections have tended to confirm.

21. Another important circumstance, one which I have also insisted upon for many years, which was formerly disbelieved, but is now fully confirmed by recent researches — namely, that all secreting organs are supplied with organic or ganglial nerves. The modes in which the viscera, both abdominal and thoracic, are supplied, are well known — namely, *first*, by fibres proceeding from numerous ganglia and plexuses, or, according to the view just stated, by fibrils originating in the organic or ganglial corpuscles, which, by microscopic aid, have been detected not only in the softer ganglia and nerves themselves, but also through the muscular tissue, the skin, the serous and the mucous surfaces; or, in other words, from fibrils originating in organic or ganglial corpuscles, and proceeding centripetally to form plexuses or ganglia in the various abdominal, thoracic, and pelvic viscera. *Secondly*, by the organic or ganglial febrils interlacing and surrounding the coats of arteries. As far back as WINSLOW, the soft or ganglial nerves were traced in the large arteries, and he represented them as forming a net-work around these arteries. In 1816, 1817, and 1819, this subject engaged my attention; and I was enabled by the microscopes then in use, which were of weak power, to trace the ganglial nerves, when the parts had been macerated for a short time in spirits of turpentine or spirits of wine, or diluted acetic acid, as far down as the lower third of the femoral artery; and my more recent researches have shown that numerous fibres proceed from the sympathetic ganglia to the gangliated roots of the spinal nerves, and thence are ramified, on the one hand, to the chord itself, and on the other, along with the spinal nerves, to the extremities and general surface. When they reach the extremities, especially near the surface, and in the vicinity of the several joints, and even as low as the ankles and wrists, they become intimately associated with sensory nerves, forming with them, small or minute ganglia, and supplying with minute fibrils the synovial surfaces. The obvious intentions of this organisation may be inferred to be — 1st, that the sensory function and the ganglial functions should be associated; and, 2nd, the vessels furnishing the secretion to the synovial surface shall be rein-

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[*] I should not now have here entered so fully as I have done on the present inquiry; but certain views comprised by it, engaged much of my attention, and not a little of my time many years ago. And when they were first published (in 1822 and 1824), they were considered by many as heterodox and visionary. They have, however, received support from the more recent researches of several eminent inquirers; and they alone of existing doctrines are capable of accounting for the *sympathies or associations of morbid function and action*, although so succinctly and imperfectly considered in this article.

forced by organic nervous energy, for the promotion of synovial secretion. The communications of the ganglial nerves with the sensory nerves and spinal chord, the numerous branches proceeding from the splanchnic ganglia to the sympathetics, and thence to the ganglionated roots of the spinal cord, and to the cord itself, explain many of the phenomena remarked in the course of diseases of the abdominal viscera, on the one hand, and of diseases of the spine, spinal cord, and joints on the other. When diseases of the joint go on so far as to produce disorganisation of the parts, we commonly find that the digestive organs sympathise more or less with them, so that loss of appetite, and even vomiting, not unfrequently supervene.

22. I have elsewhere contended, that the nerves supplying the synovial and mucous surfaces and integuments should be viewed as originating in the nervous corpuscles distributed to these parts; or, in other words, that delicate fibrils arise in, and are connected with, these corpuscles, coalesce in the extremities with the sensitive fibres, form minute ganglia with these latter, and run thence, or rather converge, towards the spino-cerebral axis. Thus, whilst the *splanchnic and sensitive nerves* may be viewed as arising in, or commencing from, the nervous corpuscles already noticed as existing in the several surfaces, viscera, and organs, and as interlacing or communicating freely with each other, and with nerves of motion, as well as supplying the circulating systems, the *motory nerves* proceed in an opposite direction. The *former converge* towards the centre, communicating with the encephalon and nerves of sense; the *latter diverge* from the spinal centre to the periphery, also communicating with the brain, from which proceed the impulses of volition by which they are influenced. The *one* class is acted upon by mental impressions or volition; the *other*, by physical causes or agents.

23. The nerves may thus be divided into *three classes*, namely — 1st, the splanchnic or visceral, or those of digestion, assimilation, circulation, and secretion; 2nd, those of general and special sensation; and 3rd, those of volition, or muscular action or motion.

24. *B.* But it is important to bear in mind *the character of the communication between these orders of nerves*, inasmuch as such communications give rise to numerous states of healthy or morbid action, and occasion, mutually, various affections of the large or nervous centres. The connections between the organic nerves and the roots of the spinal nerves, and the nerves of sensation, have not been investigated till recently; and even now not so fully as is required. This much, however, may be remarked generally, that the organic or glanglial nerves are more or less connected with all the nerves of sensation; and where the connection is formed, or where these different nerves closely approach each other, we generally find minute ganglia.

25. It has been a subject of discussion, viewing the brain as the secreting organ, as it were, of the manifestations of the mind, how the brain itself is supplied with organic or ganglial nerves. We know that the vessels of the brain, the carotids and other arteries, are all surrounded by ganglial or soft nerves; still this is an insufficient supply of these nerves, if we consider the analogy existing between this organ and the other organs of the body, — if we view the brain to be like other viscera; inasmuch as we find in other viscera, that, beside the ganglial nerves, thus distributed to the blood-vessels, there are also special ganglia, which are intended for the further supply of nervous energy to them. Take, for instance, the liver; there are, besides the organic or soft nerves supplying the blood-vessels, several ganglia and plexuses supplying the structure of the viscus itself. Take the kidneys; there are also specific ganglia devoted to the maintenance of a certain and constant amount of nervous energy, probably modified in kind, or suited to the functions of these organs. It is not, however, so manifest that the brain enjoys a similar supply of ganglia and ganglial nerves, or that the supply of these nerves, furnished through the medium of the blood-vessels, is at all sufficient for the several functions or manifestations of the brain, viewing these functions as depending upon the organic nervous ganglia and ganglial ramifications, as observed in respect of secreting viscera and organs. Hitherto the sufficiency of the supply of ganglial nerves sent to the brain with the blood-vessels has not been demonstrated, and hardly admitted; and special sources of such supply as exist in connection with the other viscera, have not been satisfactorily shown, granting that the organic nerves supplying the blood-vessels of the brain are insufficient for the discharge of the functions of this organ.

26. It has been considered, and most probably with truth — indeed I have on several occasions contended — that the pituitary and the pineal bodies are, in fact, organic nervous ganglia, inasmuch as there are communicating branches or fibrils running between the other ganglia, at the neck and about the base of the skull and these bodies. But, in opposition to this view, it has been argued that these bodies are different from other ganglia in the body. However, as all the ganglia may be considered to have a minute special organisation, according to the functions to be performed by the organ which they supply, and as the functions of the brain are so very different from those of other parts of the body, so may the ganglia, distributing their prolongations and fibres to this organ, be reasonably considered to differ also from others. These bodies are connected likewise with the soft commissures and grey substance of the brain. In fact, these bodies, like the ganglia, as well as the grey substances of the brain and spinal chord, which are the active portions of these organs, abound with organic nervous corpuscles; and they are connected, by means of delicate grey fibrils with the plexuses surrounding the arteries, and with the ganglia in the head, especially with the ganglia of Ribes, Cloquet, and Meckel. The difficulty has been to trace this connection; and unless it be admitted that these bodies are, in fact, ganglia, devoted to the office of supplying vital energy to the brain, to enable this organ to discharge its functions, we are at a loss to account for their functions. These bodies are lodged more securely than other parts from danger; they are placed near the base of the brain, and in situations the least likely to suffer from injury; and they are in connection with the commissures of the brain, where it is believed the functions of volition connect themselves with those of perception and intellect.

27. Although it is difficult to trace the connections of the ganglial nerves with the brain and the nerves of special sense, it is not so difficult to ascertain the connection of the ganglial nerves with the spinal chord and spinal nerves. The spinal nerves, especially those of volition, are all white and tubular, and are not provided with the organic nervous corpuscles seen in the ganglia and their nerves; whilst the latter are soft, grey, and ramify in an irregular and indeterminate manner, compared with the former. Now the ganglial or grey nerves, as already stated, may be traced from the sympathetics into the gangliated roots of the spinal nerves, and fibrils proceed thence to the chord itself, whilst others may be traced in an opposite direction, or from these roots, along with the spinal nerves to the extremities and surface of the body. On the other hand, ramifications of the white or spinal nerves run to the ganglia of the sympathetic nerves, and in some situations, especially in the pelvis, may be traced into the splanchnic ganglia. Thus there are — 1st, communicating branches of grey nerves running from the ganglial system to the spinal roots and chord; and, 2nd, communicating branches of white or spinal nerves proceeding from the chord to the sympathetic and ganglia. Hence the functions of each department of the nervous system are mutually aided; and impressions made upon one part of either system are extended in a more or less sensible manner to other parts.

28. The ganglia placed on or near the pelvic viscera, admit of the clear recognition not only of the intimate structure of the splanchnic ganglia, but also of the presence of white nerves, which either terminate in them, or proceed through them, and which come in greater numbers, or more palpably, from the spinal chord to them, than to any other ganglia. Thus the generative and urinary organs are supplied not only with gangial or splanchnic nerves, but also with spinal nerves, a supply of nerves from both nervous systems being necessary to the due discharge of their functions,—and the supply of each of these different orders of nerves to each of these organs is in due relation to the functions which each discharges. Thus, also, the generative organs are supplied not only with the organic nervous influence, but also with the nervous influence generated by the brain and spinal chord. And, moreover, the special ganglia devoted to these organs are mutually connected by means of communicating branches, both with the other splanchnic ganglia and with the cerebro-spinal axis.

29. I have been thus particular in directing attention to the communications between the different systems of nerves, because we are thereby enabled to explain many phenomena which occur in the course of disease. It may be, therefore, inferred, in brief, that these different orders of nerves communicate mutually by means of branches going from one to the other; and generally ganglia or plexuses are formed at or near the points of communication. There thus arises an interchange of influence, tending to the proper discharge of function; and mutual sympathy is developed when an impression is made on any one part of the circle formed by this communication and organic connection, the effects varying with the nature of the impression.

30. *C.* It is impossible to arrive at just conclusions as to the sympathy or mutual dependence of parts, without reference to *the vital property of irritability*, and the relations of this property with the nervous system. Almost up to the present day, especially from the days of Haller, irritability was considered as a function of the muscular fibre, — as a *vis insita* in that fibre, and not dependent upon the nervous system. Many years ago (in 1819, 1820, and 1821), I directed particular attention to the subject of irritability of different structures, and tried many experiments, especially in some of the lower animals; and, from these experiments and observations, I then came to the conclusion, that the irritability of fibrous and muscular parts depends upon the organic nervous system; and much more recently, this doctrine was advocated by Dr. Fletcher, in his works on Physiology, he making a due acknowledgment to me as having originated it.

31. In the first place, all irritable fibres present, when under the microscope, a more or less abundant supply of those corpuscles in which organic nerves may be said to originate, and, in fact, from which the organic nervous fibres have been detected by the microscope to take their origin, — from which they arise or proceed, and with which they abound. The involuntary muscles, and the fibrous membranes of the hollow or tubular viscera, are supplied only with soft nerves, — have no other nerves than ganglial; and they possess great power of contraction both in health and disease. This power may be traced, to a certain extent, even in the membranous portion of the trachea and bronchi; and if we refer to the comparative anatomy of these parts, especially to the trachea of some of the higher animals, we find a singular conformation of the cartilaginous rings, remarkably well calculated to antagonise the contractile force of the fibrous structure of the membranous portion of the tube. These rings are, indeed, the antagonists of the contractile power of the fibrous structure, preserving at the same time a patent state of these tubes, and admitting of a certain degree of contraction when this structure, or the soft nerves supplying it, are irritated. This conformation is very remarkable in ruminating animals, and well calculated to prevent the tracheal canal from being diminished or injuriously pressed upon during deglutition and rumination.

32. Although involuntary fibrous structures are supplied only with organic or soft nerves, and notwithstanding that the structures receive no white or voluntary nerves, nevertheless they are impressed or acted upon by the electro-galvanic influence. In 1820 and 1821, I instituted some experiments to determine the contractility of fibrous membranes, but the galvanic agency did not appear to produce much effect unless the power was very considerable. When, however, this agent is applied to the nerves of motion proceeding to voluntary muscles, the effect is very remarkable. It would appear that the voluntary muscles are supplied with voluntary or spinal nerves in addition to the supply of soft nerves received or possessed by all fibrous structures, bestowing thereby upon these muscles a voluntary and a greater power of contraction; the power and character of contraction thus varying with the nature and conformation of the muscular parts, and

with the nervous centres which supply these parts with nerves. I can scarcely follow this subject further inasmuch as I have to notice other topics that will occupy much of my limits; but it is more fully discussed in my notes to RICHERAND's *Elements of Physiology*, and in the articles "IRRITATION" and "IRRITABILITY." I have there contended that irritability depends on the organic or ganglial nervous system; and that it is exalted in the voluntary muscles, by the terminations of the motor or voluntary nerves.

33. The irritability of the heart is very remarkable. I have had opportunities of investigating it in the hearts of a number of animals, and in several fishes, — the halibut, the skate, the turbot, the cod, ling, &c. From all these, the heart may be cut out, and it will still contract for a short time after it has been separated from all nervous and vascular connections; thus showing, that not only does it take a considerable time for the influence of the ganglial nerves supplying an involuntary organ to be exhausted, but that the numerous plexuses and small ganglia, formed by these soft nerves under the serous linings and in the structure of the heart itself, and in the vicinity of blood vessels, still continue to supply nervous power to the muscular structure, and are of themselves sufficient for the continuance of the phenomena of irritability for a short time. Moreover, the heart appears to be plentifully supplied in its structure with those ganglionic corpuscles, which, as I have already stated, are intimately and organically connected with the soft, grey, or ganglial nerves; and which most probably also administer to its irritability. Owing to these provisions, a short period is required to exhaust the irritability of the organ, even when thus isolated or removed from all its connections. It is not surprising, therefore, when viewing the morbid relations of irritability, to find this vital property most remarkably modified — to observe it exalted, in one case, and depressed in another, or even otherwise altered in its condition, by agents which impress the organic nervous system, by changes in the vascular system, especially by alterations of the blood, and by the state of the cerebro-spinal nervous influence.

34. *D.* But it is not in connection with *irritability* only that the functions of the ganglial and sympathetic nervous system should be viewed. This part of the nervous system, or, more correctly, this distinct and separate system — this organic or primary nervous system — presides also over secretion and excretion, as I have already stated. If we view the digestive canal, which possesses both the vital property of irritability, and the no-less vital property of secretion — the former in connection with its muscular tunics, the latter with its villous coat and glandular apparatus — we shall find that every part of this canal, more especially the stomach, duodenum, &c., is supplied with soft or splanchnic nerves; and that this supply is not limited to those fibrils which surround the arteries of these viscera, or to others which proceed from the semilunar ganglion, and aortic plexus; but that these viscera, as well as other secreting viscera, possess, in addition, numerous minute ganglia and plexuses under their serous and proper coverings, and near to the situations of the principal blood-vessels, which minute ganglia and plexuses are more especially devoted to the functions discharged by the organ or part in which they are situated.

35. Whether the splanchnic or ganglial nerves originate in these corpuscles distributed through an organ or membrane, and successively form themselves, first into fibrils, next into plexuses and minute ganglia, and afterwards into larger branches and more manifest plexuses and ganglia, until they converge into the semi-lunar and other ganglia; or whether they originate, as believed heretofore, in the ganglia themselves, and depart thence to their destinations in the tissues, may not be readily decided; but it is indisputable that they constitute a distinct system; that they send their fibres with the blood-vessels, and with the spinal nerves, to all parts of the body, especially to secreting organs and parts; that they supply both the brain and the spinal chord; and that they form more numerous plexuses and minute ganglia in the several viscera, than have hitherto been described or even supposed; whilst, on the other hand, the intimate connection existing between these nerves and the cerebro-spinal nerves is reciprocated by numerous ramifications proceeding from the spinal nerves, — from the intercostal, lumbar, &c., — which run to the ganglia and plexuses of the organic nerves, and either proceed through these, or terminate in them, or accompany fibrils from them to various parts, retaining more or less evidently their white and tubular appearance. In viscera possessing more or less of voluntary power in addition to the organic, as the urinary and sexual organs, the vicinities of the sphincters, and the outlets of canals, &c., the supply of the white and tubular nerves — motor and sensory spinal nerves — to the ganglia and plexuses more especially devoted to the functions of these organs and parts, is more abundant and more manifest than in others, these organs combining and requiring the influence of both these nervous systems in the discharge of their functions.

36. II. MEDIA OF MORBID SYMPATHIES. — Having thus directed attention to those preliminary topics which should be duly recognised before we proceed to inquire into the several media by which one organ or part sympathises with another, or by which the morbid condition of one organ affects another, I now proceed to a general view of the MEDIA AND MODES OF MORBID SYMPATHY, for there are not only different *media*, but to a certain extent different *modes*, by which these sympathies take place. Associated morbid states, or sympathies, have been above *classed* into — 1st, the *direct*; 2nd, the *indirect*; and 3rd, the *reflected*.

37. i. The FIRST CLASS has for its media, — *firstly*, the *direct communication of nervous fibres*, more particularly the organic nervous fibres; and here the influence of the nervous ganglia in the viscera becomes a matter of very interesting consideration: every important organ is supplied with these ganglia and plexuses, which are, there is every reason to believe, peculiar or modified in size, form, and minute organisation, according to the functions each organ has to perform; — *secondly*, continuity of surface or tissue: thus the state of the mucous membrane of the stomach affects the mucous surface of the mouth, the fauces, the pharynx, &c.; — and, *thirdly the contiguity of one organ or tissue to another*: during a state of disten-

sion the colon presses on the diaphragm, so as to affect the action of the heart and other parts; and flatulence of the stomach disorders the functions of the heart and diaphragm, &c. These constitute the chief direct media of sympathy between different organs — namely, nervous communication, continuity of surface, and contiguity of situation.

38. ii. The SECOND CLASS, or *indirect modes and media* of morbid sympathy, are — *first*, by *vascular communication*. It must be obvious that when a portion of a vessel is affected, another portion of it will experience more or less of disorder. We know, in cases of inflammation or irritation of a lymphatic vessel, how readily the morbid condition extends along it and affects the glands. Here vascular communication, even in these vessels, is a ready medium for conveying morbid action; and it is still more remarkably evinced in respect of the arteries and veins.

39. *Secondly*, by the states of the circulating fluids. This is one of the most important modes in which morbid action is propagated, and it is one which forms, as it were, the basis — the groundwork, of the system of *humoral pathology*, which for many years was believed in so generally throughout the civilized world. When the morbid affections of the nervous system were so much insisted upon by HOFFMANN and CULLEN, the humoral pathology became obscured, but closer observation and less addiction to theory, have shown, that the circulating fluids are readily and early disordered in the course of disease, and, being thus disordered, they become sources of a more general malady — of disease not limited to particular organs, but extending more or less to the whole œconomy.

40. iii. The THIRD CLASS, under which I have arranged morbid sympathies, is the *reflected*. That this is not a very recently recognised class of sympathies, is shown by the fact that it was so denominated and discussed by UNZER and PROCHASKA, and more fully by me, as early as 1824. The reflected sympathies are propagated or developed — *first*, by fibrils proceeding to, and communicating with, ganglia or plexuses, and supplying by means of these sources contractile and secreting viscera. Thus irritation occasions the contraction of a portion of intestine; the irritation being propagated most probably to a nervous ganglion, and then reflected in the form of contraction. But it is not improbable, and my recollection of the phenomena I have observed upon irritating visceral parts of the lower animals seems to warrant the inference, that irritation is followed by contraction in a more direct manner, or, at least, in the manner less obviously indirect, than that now mentioned; and contraction may follow irritation without the irritating impression being conveyed to ganglia remote from the organ or part irritated. Thus, when the hearts of some fishes are removed from all their connections, they will contract upon irritation for a short time, the minute ganglial and plexuses in the structure of the organ thus enabling them to react; and so on as regards other hollow organs admitting of a sensible reaction upon irritation.

41. *Secondly*, the reflected sympathies are developed by means of the communications of the organic or ganglial, or soft nerves, with the roots of the spinal nerves. I was first led to describe the mode in which sympathetic irritation is thus propagated to the muscles of voluntary motion by a singular case which came under my care in 1821, at the Surrey Dispensary. A female, of middle age, presented herself with violent contraction and relaxations of the abdominal muscles, alternating rapidly, regularly, and constantly. The spine evinced no tenderness when examined, no pain nor any other morbid phenomena; and the functions of the extremities and of the urinary organs were unaffected. Conceiving that the affection might be sympathetic of worms in the intestines, I prescribed full doses of turpentine and castor oil, which brought away enormous quantities of lumbricus teres and fæces; and as soon as these were evacuated the morbid action ceased. The irritation of the extremities of the nerves of the digestive canal evidently was in this case conveyed to the roots of the spinal nerves, and was thence reflected by the nerves of motion upon the abdominal muscles. It does not appear necessary to infer that, in this case, the irritation was conveyed to the spinal chord itself, inasmuch as neither morbid sensibility, nor other disorder could be traced to it. We can explain the phenomena by considering that morbid irritation was transmitted merely to the roots of the spinal nerves by the ganglial and sympathetic nerves, and that the irritation thus transmitted to these roots produced this affection of the abdominal muscles. The second class, then, of reflected sympathies are those reflected by the ganglionated roots of the spinal nerves.

42. *Thirdly*, irritations, or impressions, are reflected from internal viscera and internal parts, by means, or through the media, of the spinal chord and nerves to the voluntary muscles and extremities of spinal nerves, motion, or sensibility, or both being thereby affected, as shown in several diseases, more especially in hysteria, chorea, neuralgia, tetanus, &c.

43. The *fourth, or last order of reflected sympathies*, are those which take place through the medium of the *medulla oblongata or brain*, or of both. It has long been proved that impressions made on the organs of sense will occasion reflex actions. Indeed, all the phenomena of mind may be said, so far as they produce any sensible motion or action in the œconomy, to be reflected. This class of sympathies are attended generally in the waking state by consciousness, although not necessarily and uniformly; but during sleep, sensibility, or consciousness is only occasionally and obscurely excited.

44. III. CIRCUMSTANCES INFLUENCING SYMPATHETIC PHENOMENA. — Having sketched the several modes in which morbid actions or states become associated, and, at the same time, considering that these associations are often brought about through more than one channel, I proceed next briefly to advert to the well-ascertained fact, that irritations, or morbid conditions of any other kind, may exist in organs or parts without producing those sympathetic or symptomatic phenomena which we observe in other persons in a more or less marked degree; and that *sympathetic phenomena vary not only in degree, but also in some measure in character and variety, or number, with the temperament, with the habit of body, with the sex, with the age, with the physical powers, and with the occupations of the individual.*

45. i. It is difficult to determine in what degree

or mode the various sympathetic phenomena, manifested by the human subject may vary in the *different races of the species*. Judging from my own observation, I am inclined to infer, that they are most diversified, numerous, and manifest amongst the most highly cultivated and luxurious of the Caucasian race, and that they are the least diversified, and the least manifest in the negro and the hyperborean races.

46. ii. *Temperament, idiosyncrasy, or diathesis*, has evidently a great influence upon the sympathies — the nervous and irritable temperaments evincing the most varied and most numerous and prominent sympathies; the phlegmatic limiting their range and diminishing their intensity. In nervous, impressible, and excitable persons, irritation or excitement, on the one hand, or depression or exhaustion on the other, in whatever part of the œconomy it may exist, but more especially in sensitive and vital parts, is soon followed by various sympathetic changes, which either would not appear, or not appear to the same extent, in phlegmatic, robust, and muscular persons.

47. iii. Much, however, depends upon the *habit of body* and the vascular conditions of the individual. It may be difficult to determine correctly whether or no fat or very lean persons evince the more prominent range of morbid sympathies. Most probably, thin or lean persons are not only more susceptible of sympathetic phenomena, but also evince them more prominently than those who are the subjects of greater or less obesity. A similar difficulty exists respecting the greater influence exerted by vascular plethora, or by deficiency of blood. Probably both extremes, or even an approach to either extreme, may favour the development of morbid sympathies much more than a healthy state of the vascular system — than when a due relation subsists between the contained fluid and the containing vessels—between the healthy quality of the circulating fluids and the tone and energy of the moving powers.

48. iv. *Sex* has a most manifest influence upon the number, character, and prominence of the sympathies. In females, especially those of a nervous and impressible temperament, both the range and the intensity of these phenomena are most striking, and the phenomena developed are most frequently connected with irritation of a particular organ or part, and are attended by more or less morbid sensibility; the nervous systems being generally the media by which their sympathetic affections are developed. In proportion as nervous power is impaired, exhausted, or originally defective in this sex, the more remarkably are susceptibility and excitability manifested, and their more remote consequences evolved. The same remark applies also to males, but the sympathetic phenomena are not so manifest in them, unless in cases of great exhaustion of nervous power.

49. v. *Age* has also a very manifest influence upon the sympathies; the earlier the age, the more readily and rapidly are they developed by the primary morbid affection, and the less frequently are they connected with organic lesions. As life advances, sympathetic phenomena are less frequently and less rapidly evolved; and structural changes either proceed further without producing them, or produce them less frequently, with less severity, and in less variety. This is especially the case after fifty years of age, and after the latter climacteric age of females. At the period of female puberty, and about the period of the latter sexual change in this sex, sympathetic affections are frequent, prominent, and varied; and in many they continue, at intervals, to partake more or less of this character throughout the whole epoch of uterine activity. After the periods of dentition are passed, when the sympathies are most remarkable, owing to the relations subsisting between the state of the gums and both the ganglial and the cerebro-spinal nervous systems, the most important epoch of both healthy and morbid sympathy — or rather of synergy or physiological sympathy — is the epoch of puberty; after which sympathetic affections diminish in frequency and intensity in this sex, unless in crowded towns, in persons following sedentary occupations, and in the debilitated.

50. vi. The state of *physical power* has manifestly no mean influence upon the sympathies. Where this power has been originally great — where it is associated with nervous energy, and with perfect states of the digestive and assimilative functions — there sympathetic affections are least frequently and least severely complained of, and the least complicated. When organic nervous power is depressed or exhausted, more especially when the exhaustion has proceeded slowly, and continued long, a very different result is observed; the irritation of a particular organ, or part, then developes various affections, sometimes of the same, at other times of a different character, in different or several parts of the frame. Numerous instances illustrative of this pathological position present themselves in practice amongst both sexes, especially about puberty, and for many years afterwards, more particularly in the female sex.

51. vii. The *occupations* of life exert great influence upon the liability to severe or complicated sympathies. It is obvious that sedentary persons, or those occupied in ways which preclude the due exercise of the body in the open air, more especially if they pass much of their time in large towns, or in the impure air of factories, or in unhealthy localities, and those who exert the mind upon abstruse or abstract subjects, will sooner or later acquire an increased susceptibility of morbid impressions and irritations, and these irritations will in them develope a wider range, and a more intense grade, of sympathetic affections than in others not similarly circumstanced, all other things being equal. It is incompatible with my limits to pursue this subject further, or to illustrate my positions by referring to acknowledged facts. This, as well as what I shall have hereafter to advance, must be viewed rather as suggestive, than as sufficiently illustrative of the subject.

52. IV. Special Consideration of Sympathetic or Associated Disorders. — I next proceed to consider, in a more special manner, some of the sympathies most frequently observed in practice, and briefly to notice, or merely to enumerate, others. In the view I am about to take of *sympathetic* or *associated morbid states*, I shall consider in succession, *first*, the associated morbid states of digestion and assimilation; *secondly*, the sympathetic phenomena connected with the circulatory and respiratory functions; *thirdly*, sympathies, or associated morbid states of sensa-

tion and sensibility; *fourthly*, associated functions, or sympathies of animal motion; and *lastly*, the sympathies, or morbid states of the organs of reproduction. I should not have directed attention to this subject, if I had considered that former writers had discussed it fully; but I believe that it will be found, upon referring to pathological writings, that not much has hitherto been said satisfactorily upon it. That morbid sympathies are propagated throught he channels, I have attempted to point out, receives so frequent a confirmation, and is indeed so constantly observed in practice, that we may conclude that a person labouring under any specific disease, as described by nosological writers, is seldom seen without presenting important morbid associations and sympathetic phenomena. We rarely meet, in the course of medical practice, with a disease implicating one particular tissue or organ, without involving, more or less during its progress, distant, although related (related in the manner I have attempted to point out), functions or organs —without displaying various sympathetic phenomena, or associated morbid sensations, conditions, or actions, owing to the several relations which I have here attempted to establish. I now proceed to consider the *first Class*.

53. i. ASSOCIATED SYMPATHIES OR AFFECTIONS OF THE DIGESTIVE OR ASSIMILATIVE ORGANS.— These organs are most important as respects vitality; they are observed throughout the animal kingdom, and, as being intimately connected with the origin and perpetuation of life, demand our more immediate consideration. The sympathies, or associated states of digestion and assimilation, are to be referred,—*first*, to the circumstance of these organs being supplied with the same system or order of nerves, the ganglial, and, even according to the view I have suggested, of these nerves partly originating in the villous surfaces and parenchyma of these organs, as shown by the microscope; and to the presence of the organic nervous corpuscles, and their incipient arrangement into fibres, in these tissues and organs. The circumstance of the organic or soft nervous fibres originating thus, and the extension of these fibres to plexuses and ganglia, and thence to the nervous system of animal life, serve to show, or at least go far to explain the fact, that disorders affecting these organs, especially the alimentary canal, affect more or less distant parts, remote organs or parts thereby sympathising with them. *Secondly*, to the similarity and continuity of structure existing through a large portion of these organs, particularly the digestive canal. *Thirdly*, to the contiguity of their position. *Fourthly*, to the association of function and normal action. *Fifthly*, to the several vascular connections existing between them. Thus it is not through one channel only that these associations are kept up, for no less than five may be considered as contributing to the several states of morbid sympathies or associations which the digestive and assimilative organs present in practice.

54. *First*, the associations of the morbid states of the organs of digestion and assimilation with each other are amongst the most frequent and prominent in the human economy.—*A*. When we view the intimate connections existing between the digestive canal and its allied viscera, especially the liver and pancreas, by means of the splanchnic ganglia, plexuses, and ramifications, and of the vascular system, the frequency of these morbid associations cannot remain a matter of surprise. When we consider also the relations of the portal circulation, and view it (as it really is) as independent, in a great measure, of the action of the heart, indeed, so much so as that the return of blood from the liver is much more under the control of the heart, than the supply of blood to the organ by the portal vein,— or, in other words, that the return of blood from the hepatic vein is owing more to the action of the heart, than the circulation through the portal system is owing to this organ,— we must necessarily infer the operation of some other agency than the heart in carrying on this circulation. Now, the capsule of GLISSON, and the ganglial nerves, with which both it and the portal vein are provided, are in my opinion the chief agents of this important and independent circulation,—agents which operate through the medium of their distributions throughout the organ along with this vein, and which influence not only the circulation of it, but also the circulation of the bile along the ducts. That this capsule at least contributes to, if it does not entirely discharge, this function, may be inferred from its organisation; for it is abundantly supplied with ganglial corpuscles and fibrils, and it may therefore be considered as exercising important vital functions. When, therefore, we reflect upon the nervous and vascular connections of the digestive organs, we must admit that affections of one of the series will be readily propagated to others, and that disorder of the functions of one will necessarily affect more or less the rest. We frequently observe in practice, that disorders of the stomach or bowels impede or otherwise affect the functions of the liver; and that torpor, obstructions, congestions, or other disorders of this organ, are followed by affections of the stomach, by congestions of the digestive mucous surface, and indeed of all the vessels which combine to form the portal system; and we have, as more remote consequences, when the original mischief remains, increased exhalations, hæmorrhages, hæmorrhoidal affections, jaundice, and even serous effusion into the peritoneal cavity.

55. Morbid states of the intestinal canal also remarkably affect the functions of the liver, through the medium of the splanchnic nerves, and by influencing the states of the portal system. Irritation of the mucous surface of the intestines, especially of the duodenum and jejunum, is readily propagated to the portal system, and this effect is the most rapidly developed in warm climates, where active determination of blood to the liver, and congestive and other forms of inflammation of it, are thus observed frequently to supervene. The intimate connection subsisting between these viscera pathologically is evinced also in fevers; and in these, both in the mode just adverted to, and in another of a different kind. In the course of fevers, hæmorrhages from the digestive mucous surface are not infrequent occurrences, and are most unfavourable as respects the vascular system generally, the portal circulation especially, and the vital powers. In yellow or hæmagastric fever, a fatal termination is generally by a black vomit, which consists chiefly of the blood that has exuded from

the mucous surface of the stomach, and often to such an extent as to leave the liver of a pale yellow colour, or altogether bloodless, upon dissection. In these cases, the blood, instead of being carried into the portal vein, is exuded from the digestive mucous surface, leaving the liver in a state of anæmia, especially as regards this vein. (See §§ 128, 129.)

56. *B. Contiguity or proximity of position* has a great effect in complicating diseases of the digestive organs. This is evidenced by inflammations and inflammatory fevers, more especially when the serous surface of either of these organs is affected. Owing to contiguity, the inflammation is rapidly propagated from one surface to another, not so much by continuity of surface as by contiguity of position. When making post-mortem examinations, I have often found that the opposite surfaces of different organs had become inflamed; that lymph had been thrown out from both at the place of contact, and yet the intervening portion of surface, where contact did not exist, presented no change — that is to say, the inflammation was not propagated by continuity, but by the contact of opposite surfaces: the lymph thrown out from the primarily-inflamed surface had acted as an irritant to the vessels of the opposite part, with which it came in contact, and given rise to inflammation; false membranes, or exudations of lymph, adhesions, &c., being the consequences.

57. Owing to continuity of surface, and similarity of structure, disease extends, — more especially erythematic, or asthenic, or cachectic inflammations, — along the mucous and serous surfaces, varying in severity in different viscera or situations. Thus inflammations extend not only downwards, but also upwards, — from the stomach to the intestines, — from the cæcum to the colon and rectum, — from the stomach to the œsophagus, pharynx, and fauces, — and from these latter to the trachea, bronchi, &c. Irritations or inflammations of the mucous surface of the duodenum may extend to the mucous surface covering the ducts, especially in weak or cachectic constitutions, in which this extension is most likely to occur; the extension of inflammatory action being most likely to take place in debilitated and cachectic persons, producing inflammation of the ducts, and even of the viscera, from which these ducts proceed; and the limitation of this action being equally favoured by vital or constitutional power.

58. *C.* The state of the muscular tunics of the digestive canal frequently gives rise to important sympathetic phenomena. When the colon is much distended with flatus, or irritated by sordes or morbid secretions, or accumulated fæcal matters, various changes occur, not only in the portion of the canal above the seat of these affections, but also in other parts in the vicinity. I have pointed out already, that, in such cases, owing to the nervous communication subsisting between the intestinal canal, the splanchnic ganglia, and the spinal nerves, numerous sympathetic disorders frequently also arise, especially pain in the joints, and various spasmodic affections. I refer merely to the very common phenomena of spasms of the limbs and lower extremities, occurring in bilious colic or in common cholera, and in poisoning by corrosive or irritating substances.

59. *D.* When the circulation is interrupted through the liver, the digestive canal becomes materially affected; and, when the latter is deranged, then the former is disordered, and the portal circulation is also more or less deranged. Not only are the functions of the liver and digestive canal thus mutually disturbed in a very remarkable manner, but these disturbances also affect the urinary excretion and the kidneys. When the chyle is not sufficiently assimilated, or when the ingesta are of a character likely to produce inordinate excitement, or other derangement of the vasculari system, there are not only associated affections of the liver, through the portal system, but also, in consequence of the morbid changes taking place in the blood, further changes, more or less extensive, occur in the urinary excretion and organs, particularly in the kidneys. When individuals are otherwise in health, and the kidneys are enabled by nervous power to execute their functions, morbid matters, carried into the blood, are readily eliminated from it by these organs, producing various changes in the urinary excretion; but when the vital powers are weak, either from lesion of the spinal chord or nerves, or of the ganglia supplying those organs, or from general nervous depression or exhaustion, then there will be observed more or less serious disorder of the urine, or even of the kidneys themselves.

60. Even in comparative health we find a very intimate connection existing between the states of other excreting organs and the kidneys. For instance, when the functions of the kidneys are but temporarily obstructed, the blood to a certain degree becomes impure, and very important and deleterious elements, which should have been eliminated from the blood by these channels, are then either vicariously removed by other emunctories, the circulation being the while often more or less disordered, or the blood becomes contaminated and the vessels congested. Again, when the function of the cutaneous surface is materially deranged, — when it is suppressed, — if the individual is otherwise healthy, — if there is no disorder connected with the urinary organs, — these organs perform an increased function, and matters which should have been carried out of the system by the skin are removed by the kidneys, and often no severe disorder arises; but not unfrequently serious derangements take place, owing to suppression of the cutaneous function. Thus disease of the skin, or suppressed perspiration, or disorder of the urinary functions, often produces a number of morbid actions, — at first vicariously, — occasioning increased action of the one emunctory as the action of the other is impaired or obstructed, and subsequently very serious changes, both of the blood and of vital organs and parts, if the impaired or suppressed function be not restored.

61. The most serious and rapid derangements are produced in the circulating fluids, and consecutively in other parts of the economy, by impeded or obstructed function of the kidneys. In all lesions of these organs, especially in that which is called "Bright's disease," very important changes take place in the circulation; and, owing to these, further changes are produced in distant and different parts of the economy: the heart and the liver, the mucous and serous membranes, owing to the state of the blood, and more particularly to

the circulation of effete or injurious elements in it, become irritated; and organic changes, especially asthenic or spreading inflammation, the exudation of lymph, and more frequently of a serous or albuminous fluid, take place on the surfaces of these organs and of these membranes.

62. In connection with disorder of the digestive organs, we very frequently find the appearance of the skin more or less changed, even independently of the actual existence of jaundice. It would appear that, when the liver is torpid or inactive, or when affections of the liver are connected with disorder of the stomach, or of the spleen, or of the bowels, that the blood becomes more or less impure, or even deficient in red globules; and, consequently, the external surface and the countenance are more or less sallow, lurid, or without the vital glow of health. The liver performs not only secreting but excreting functions; it eliminates certain elements from the circulation, which, if allowed to remain, would produce more or less disorder: it thus depurates the blood to some extent; and hence we find that, in torpid affections of the liver, these elements accumulate in the blood, and, independently of true jaundice, produce slight pseudo-jaundice, or a lurid state of the skin and countenance, which is attributable to the impaired excretion of materials, which usually contribute to the formation of bile. But in cases of jaundice, where the obstruction is more serious, owing to the excretion of bile from the liver being impeded or prevented; or to the presence of calculi in the ducts, or in the gall-bladder; or to numerous organic changes that take place in the organ, there are certain constituents of the bile absorbed into the circulation, and certain of these more abundantly in some cases than in others. In some instances the colouring matter only is present, whilst, in others, the resinous portion of the bile, or the *bilin* of modern chemists, is carried into the circulation. It is very rarely that bile can be detected in the blood, but it has been detected in the urine; and we may therefore infer that it must have passed through the circulation before it arrived there, and that the kidneys, by the active discharge of their functions, have carried it out before it could accumulate in the blood so as to enable the chemist to detect it by the taste of the blood, or by the usual tests. I have already adverted to the effect of congestion, or interrupted circulation in the liver, on the abdominal organs generally, especially upon the digestive canal. I believe that this morbid association is not sufficiently attended to, particularly in respect of the diseases most prevalent in malarious and warm climates, and in fevers and disorders of the bowels in temperate countries; but my limits prevent me from pursuing this topic any further at this place.

63. ii. THE SYMPATHY BETWEEN THE DIGESTIVE ORGANS AND THE FUNCTIONS OF THE HEART AND LUNGS, owing to the media of association above described, is so marked, that disorder of any one of these organs naturally produces a reciprocative disorder in the other organs. Thus, increased excitement of the nervous system occasions excitement of the vascular system; and exhaustion or debility of the organic nervous system produces a similar state of all the organs which this system actuates. It may be considered an axiom, that increased excitement, or its opposite, namely, exhaustion or debility, however produced, is attended by a co-ordinate grade of such state, in the several vital organs. So obviously is this the case, that it is unnecessary to enlarge upon it.

64. *A. By contiguity of position*, the digestive, circulating, and respiratory organs are often very materially affected. Distension of the stomach or alimentary canal mechanically impedes the function of the other organs, and heightens inflammatory or structural lesions. Hence arises a deranged state of the circulation and of respiration in individuals in whom the nervous energy is weak, and where the contractile power of the parietes of the heart is to a certain extent weakened also. The contractile actions of the heart are much influenced by the distension of contiguous viscera. Flatus distending the stomach, and rising to the œsophagus, often produces intermittent or irregular pulse and various consecutive phenomena. This is frequently seen in cases of flatulency of the digestive organs. Very serious affections supervene in the case of hysterical and nervous patients, where the flatus rises up in the form of globus hystericus, producing inordinate distension of the œsophagus, with spasm above or below, or both above and below, the seat of this distension. The phenomena remarked in hysteria, in colic, and in flatulent distensions of the colon, may further illustrate the influence of mechanical distensions of parts of the digestive canal upon the functions of the heart and lungs; and hence it is, when the nervous and muscular powers of the heart are impaired, or when the vital expansive power of the lungs is weakened, that flatulent distentions of the stomach or of the colon increase the mischief. The number of morbid sympathies that I shall have to mention in the confined space to which I am limited, prevents me from illustrating fully this subject.

65. *B.* In considering the relation of the circulating and respiratory functions, it is unnecessary to do more than to notice the very great influence which the latter exert upon the former; the remarkable changes produced by the atmosphere during respiration, and the advantages that acrue from respiring pure air, not only in promoting a normal state of the blood, but in strengthening the locomotive functions. Air and exercise are the best restoratives that we possess — the principal tonics that we can employ in removing disorder. Those medicinal tonics which are frequently substituted for these, owing either to the circumstances of the case, or to the views of the physician, are generally more or less stimulants also, and may be injurious, and indeed are often hurtful, when injudiciously employed. But when the patient can have change of air,—when he is able to undergo a change, and can be duly exposed to the air and to the sun's influence, and more especially when he can take sufficient exercise in the air,—due assimilation of the food, healthy changes in the blood by the respiratory organs and cutaneous surface, and the development of nervous and vital energies, are the usual results.

66. *C.* I need only briefly refer to the intimate sympathy between the *digestive and the respiratory functions, surfaces, and organs*. It rarely occurs that the respiratory mucous surface is much affected without the digestive mucous surface being also more or less disordered, or that the latter is

seriously deranged without some disorder or susceptibility of disorder being manifested by the former, the association being clearly referable to the nervous system in the more immediate effects, and to the vascular system in the progress of the disorder. But affections of the mucous or villous surfaces of these distinct organs, although often thus appearing in succession — the one arising or depending upon the other — often also occur contemporaneously and co-ordinately. This form of association frequently is the result of endemic causes, and of epidemic influences; the morbid impression of these causes often extending rapidly, and manifesting its effect upon the digestive organs soon after it has acted upon the respiratory functions. Catarrhs, influenzas, hooping-cough, and other epidemic disorders which proceed from or are influenced by the states or vicissitudes of the atmosphere, and prevail at certain seasons, especially manifest this association; and those more formidable epidemics which arise from an atmospheric contamination, caused by the emanations proceeding from the sick, or from numbers of living creatures confined in a limited space, or from dead vegetable and animal matter, evince the same association, although in a much more remarkable manner, and are greatly heightened by contamination of the fluids and soft solids of the body.

67. When the atmosphere contains only a small or moderate amount of malaria, or of animal emanations, or a quantity insufficient to contaminate it to a pestilential extent, or even to cause agues or remittents, then disorders of the digestive organs, associated with affections of the respiratory and circulating functions, frequently result. In large towns and cities, especially where a humid and close air is more or less contaminated with animal exhalations, the prevailing disorders of the digestive organs are very often associated with affections of the respiratory organs, more particularly with chronic or asthenic bronchitis, or with congested states of the lungs. This association is most frequent amongst the children of the poor; either affection predominating over or masking the other, owing to the intensity or combination of the causes.

68. Whether those causes affect children, adults, or the aged — more especially if the more ordinary physical conditions and vicissitudes of the atmosphere have added to them, animal emanations, putrid effluvia, and insufficient ventilation — the effects produced seldom consist of a simple or specific state of disease, but of an association of maladies; one or two assuming a more distinct or prominent form, according to the intensity of the efficient agent, to the nature of concurring influences, and to the state or predisposition of the patient's constitution. This complication becomes still greater, and much more serious, if these causes not only injuriously impress the organic or ganglial nervous system, but also, either through the medium of this system, or still more directly, contaminate the circulating fluids, — the contamination arising both from the impairment of depurating processes performed by the various emunctories, and from the passage of injurious agents into the blood during respiration.

69. Physicians who observe closely the morbid conditions constantly coming before them must have remarked, especially in large towns, where numerous injurious agents are in almost continued operation, and amongst persons who attend the least to the healthy states of the digestive and excreting functions, that when the digestive functions are much impaired, or when the digestive mucous surface presents those phenomena which may rationally be referred to chronic irritation, numerous associated disorders soon present themselves. The hepatic functions are deranged; often also the bowels are affected; and ultimately even the excretions from the skin and kidneys betray more or less disorder. The results of these morbid conditions, or more frequently the contemporaneous mischiefs, comprise changes in the nervous and vascular systems — functional changes in the organic nervous system, being followed by impairment of the excreting or depurating actions, and this impairment by an altered state of the blood itself; this last acting upon the former, and aggravating them. As long as vital power or resistance to the injurious agents is not entirely overthrown, various vicissitudes occur in the course of functional disorder, in the states which the several organs implicated present, and in the consequences which accrue in respect of each, under the influence of either aided or unaided vitality. But not unfrequently various serious phenomena, threatening the duration of life, appear, owing to contingent causes and morbid predispositions. It is thus we so frequently observe in practice, among persons who have been previously out of health, who have been intemperate and dissipated, who have suffered from functional disorders of the stomach, or liver, or bowels, or kidneys, or from an association of two or more of these, that far more serious maladies are superinduced; that, owing to the morbid state of the blood from impaired action of the emunctories, and to the disposition of irritation or inflammation of membranous parts to spread in these circumstances, erysipelas thus often appears in the seat of an abrasion or injury, especially in certain atmospheric conditions; that the pharynx or fauces, or both, sometimes with their connected glands, become affected with a spreading or asthenic inflammation, that the lesion, owing to continuity of texture and weakened vital resistance, proceeds either along the œsophagus to the stomach, or, what is still worse, it extends from the pharynx to the epiglottis, or even down the trachea, causing distressing paroxysms of cough, or threatening, and even causing suffocation from closure of the glottis, or fatal conjestion of the lungs. The lesion, thus first manifesting itself in the fauces or pharynx, may actually even commence in the stomach, and extend upwards along the œsophagus to the pharynx, without the œsophageal affection being either recognised or prominently developed, until the more sensitive and susceptible pharynx is reached. Indeed, it is not unfrequently observed, that acrid eructations from a dyspeptic stomach, or owing to a state of gastro-enteric irritation, excite an asthenic form of inflammation of the pharynx and posterior fauces, which sometimes spreads in one or other of the directions just pointed out, either involving merely, or chiefly, the upper portion of the œsophagus, or implicating more especially the epiglottis and larynx, or even also the trachea. These are some of the more serious or extreme morbid associations observed between the digestive and

respiratory organs; but others of a slighter grade are much more common; these are stomach cough, the *catarrhus stomachicus*, *catarrhus saburralis*, &c. of older writers; the association of gastro-intestinal irritation with catarrah, or with bronchitis, or other affections of collatitious or even of distant viscera, &c.

70. iii. The Sympathies of the Digestive Organs with the Brain and with the Organs of Sense, and of the latter with the former, are sufficiently manifest. But it is very frequently by no means easy, when the associated morbid conditions come before us in practice, to determine the organ primarily affected, and most probably the source or centre of the associated affections.—*A*. The *media* of morbid association in many of these complications are obviously, and primarily, the ganglial and the cerebo-spinal nervous systems, as already explained. But cases are not few, which acknowledge, not only these media, but also the vascular system — a morbid condition of the circulating fluids. When the blood is loaded with effete matters, or is not sufficiently acted upon in the liver, or changed by the several depurating organs, or by the lungs, or by the kidneys and skin, it affects the brain, producing, more or less, disorder according to the nature of the existing impurity. This state of the blood, in its slighter grades, may give rise only to lassitude, or to a state of apathy, or more or less lethargy. It is not improbable that the lethargy observed after a full meal is partly caused by the passage of chyle into the blood, which, to a certain extent, changes the state of this fluid, and affects the brain. When the blood is more seriously altered, when it is affected by obstruction of the excretion of bile, and when it is still more remarkably changed, both in quantity and quality, by disease of the kidneys, the effect upon the brain is often serious, and in the latter case, even fatal. In more common cases and circumstances, and in those of much more frequent occurrence, impaired digestion, is followed by imperfect assimilation of the chyle; this latter, more or less, affects the blood, and the state of the blood thus produced often affects the sensibility of the brain and nervous system, either temporarily, or at intervals, even before the actions of the emunctories are manifestly impeded or otherwise disordered.

71. *B*. *The organs of sense* often sympathise with disorders of the digestive organs. Those of sight, hearing, smell and taste, are severally weakened or rendered more susceptible of impressions, in some instances, or less so in others, when the functions of digestion are imperfectly performed, owing to impairment of the ganglial nervous power, actuating the digestive organs, having extended to the nerves and organs of sense, with which the ganglial nerves are intimately connected, especially as respects the cerebral and cervical ganglia and plexuses. Nor should it be overlooked, that, when the influence or power of the ganglial nerves, which supply the vessels and membranes secreting the fluids which enable the nerves of sense to perform their functions, is insufficiently exerted or is depressed, these fluids are then insufficiently secreted, the membranes imperfectly nourished; and consequently, the sensorial surfaces, and the terminations of the nerves of sense in these surfaces, are not in a fit state to receive impressions, and are incapable of transmitting them so vividly and perfectly as if the organic or ganglial nervous system duly discharged its duty.

72. iv. The Locomotive Apparatus sympathises more or less with the State of the Digestive and Assimilating Organs. — The former, however, may not be much affected when the latter are slightly disordered; but if the disorder of the digestive functions continue long, or if it be great, — if the organic nervous or vital energy of these organs be much reduced or exhausted by previous excitement, and, still more remarkably, if this depression of vital energy have, owing to its continuance or severity, given rise to a morbid condition of the circulating fluids, or to an excrementitial plethora, the locomotive power always suffers more or less. The joints are particularly disposed to manifest disorder when the digestive and assimilating functions are imperfectly performed, and the secreting apparatus of the joints then suffers more especially. When urea, or its elements, accumulate in the blood, or, indeed, when either these or other excrementitial elements accumulate in the circulation, or when mal-assimilated or other injurious matters are conveyed into the circulating fluids, and more particularly when the functions of the liver, of the bowels, and of the kidneys, betray disorder, the joints then often become seriously affected. If the history of various diseases affecting the joints be carefully traced, and their several morbid relations observed, it will very often be found that impaired digestion and assimilating function, as well as impeded excretion, has long preceded, and often still more remarkably attends, the affection of the joint. *Gout* furnishes the most remarkable instance of this morbid association; but rheumatism also displays it. Other disorders hereafter to be mentioned, as hysteria, also betray the connection between them and affections of both the joints and the digestive organs. The sympathy in these mordid associations is obviously dependent upon the ganglial nervous system and its connection with the sensory spinal nerves, and is increased and rendered more permanent, especially in gout, by changes in the circulating fluids, and by imperfect elimination of effete materials, or of the ultimate products of assimilation and animalization, by the several emunctories.

73. v. The Sympathies of the Reproductive Organs with the Functions of Digestion are often obvious. They will be more particularly noticed in the sequel; but I may now observe that debility of the latter often deranges the former, or predisposes to most of the disorders to which the reproductive organs, especially of the female, are liable. There is, however, a mutual action and reaction between disordered conditions of these organs and the organs of digestion; and even in these cases, which occur so frequently in practice, where the association of these disorders is very remarkable, it is often very difficult to determine which of these organs is primarily in fault. Many cases of chlorosis, of amenorrhœa or dysmenorrhœa, or even of menstrual obstruction, of hysteria, and of leucorrhœa, are more or less dependent upon disordered digestion and assimilation, whilst others originate, as will be mentioned hereafter, very differently, and consecutively derange the digestive functions.

74. V. THE SYMPATHETIC AND SYMPTOMATIC PHENOMENA CONNECTED WITH THE CIRCULATING AND RESPIRATORY FUNCTIONS.—I shall here offer some observations on the importance of considering morbid action with reference to the state of the circulating fluids.—i. Having discussed, as fully as my limits permit, the nervous connections giving rise to numerous and obvious sympathies, I shall now take a general view of *alterations of the blood itself*, as being productive of diseased action, either in succession or contemporaneously, in two or more distinct or distant organs, or more or less throughout the frame. In disorders of the circulating fluids, particularly of the blood, the most extensive and serious associations of disease often arise to which the animal economy is liable.

75. The circulating and respiratory functions are intimately associated with each other, not only by nervous and vascular connections, but also by position and by the nature of the functions themselves; a certain amount of change of the constituent elements of the blood always taking place during respiration, and also a reaction of the blood on the respiratory organs, and on the heart and blood-vessels. These vital functions, although presenting more or less prominent relations to disorders of other or distant organs, are often, owing to these circumstances, jointly and correlatively the affected.

76. *A*. Before I take a cursory view of the results of chemical researches into the morbid changes of the blood, I shall briefly notice the *healthy composition of this fluid*. From a series of analyses, SIMON considered that 1000 parts of healthy blood consist of $795\frac{3}{10}$ of water, and about $204\frac{3}{10}$ of solid residue. In the latter there are $2\frac{1}{10}$ of fibrin; $2\frac{3}{10}$ of fat; $76\frac{6}{10}$ of albumen; $109\frac{3}{10}$ of hæmato-globulin; and about 12 parts of salts and extractive matter. These being the mean proportions in health, it has been attempted to establish the deviations which take place in these constituents in disease. A number of chemists and physiologists have performed experiments on the blood both in health and in disease, but there is a considerable difference between the results at which they have arrived; still there is sufficient agreement to warrant the importance of attention being devoted to subject.

77. In *disease*, the water varies from 888 parts in 1000 to 750 parts; the solid residue from 250 to 112. Of the different matters forming the solid residue, fibrine varies from $9\frac{1}{10}$ to a trace merely; the fat, from $4\frac{3}{10}$ to only $\frac{7}{10}$; the albumen from 131 to $55\frac{1}{10}$; the hæmato-globulin, from $115\frac{4}{10}$ to $31\frac{8}{10}$; the extractive matter and salts from $16\frac{6}{10}$ to $7\frac{6}{10}$; these results thus showing a very considerable variation in the quantities of the several constituents of the blood in disease.

78. *Healthy blood*, again, according to LECANU, consists of 790 parts in each 1000 of water, and 210 parts of solid residue. Of the latter, 3 parts consist of fibrin, 127 of blood corpuscles, 72 of albumen, and 8 of extractive matter and salts, or what he calls inorganic matter. According to ANDRAL and GAVARRET, taking this to be the standard of health, these constituents vary in *disease* as follows:—The water from 915 parts in each 1000, to 725; the solid residue from 275 to 85. Of the latter, the fibrin varies from $10\frac{4}{10}$ to $\frac{9}{10}$ only; the blood-corpuscles from 185 to 21; the albumen from 114 to 57.

79. It must be evident that the blood which is taken from young, healthy, or robust persons, especially those of the sanguine temperament and the phlogistic diathesis, will exhibit a large proportion of blood-globules or corpuscles, and also of fibrin; whilst the blood of leuco-phlegmatic or of chlorotic and anæmied persons will furnish the smallest proportion of these constituents and the largest quantity of water. When the blood is removed, or being removed, from a vein, and especially as it circulates in the vessels, there certainly exists in it more or less carbonic acid, although the exact quantity — probably of various amount with the varying state of the system — can hardly be shown by experiment. It is, doubtless, given off so immediately, on being removed from a vein, that its exact quantity scarcely admits of demonstration. The blood also presents a certain *odour*, either independently of, or connected with, the halitus, or vapour, or carbonic acid, which it exhales, when drawn from a vein or artery; and this odour is very remarkable in malignant and infectious diseases, and especially in pestilential fevers.

80. It is very manifest that the blood, when circulating in the system, possesses a vital endowment, derived from the organic nervous influence, bestowed by means of the organic nerves on the blood-vessels, and on the tissues and parenchyma of organs through which the blood circulates. This vitality of the circulating fluids, thus derived, may be traced in the chyle, and is manifested by this fluid as soon as it begins to circulate in the lacteals, inasmuch as it presents analogous changes to those evinced by the blood itself, as respects coagulation, when removed from these vessels.

81. The globules of the chyle present the first appearances of organisation; or, in other words, assimilation and organisation, commencing in the chyle and manifesting themselves in the conformation of the globules formed in this fluid, proceed as the chyle passes through the glands, becoming more distinct and perfect as the chyle advances and reaches the ducts conveying it into the blood. The globules of the chyle, being thus more perfect and more numerous the nearer they approach the venous circulation, and after having passed through lacteal glands and having derived some vitality from the vessels and glands through which they have circulated, possess in consequence a vital relation with these parts, tending, not merely to promote their circulation onwards to the blood-vessels, but preparing them also for further changes,—for a more advanced grade of organisation, when they have reached this goal, and for the assumption of the character of perfect blood-globules.* It is not at all im-

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* Since this article was written, the researches of Mr. WHARTON JONES, on the blood, have been published in the Philosophical Transactions. From these it would appear that the chyle-corpuscles pass through the following phases of development before or by the time of their reaching the venous circulation: — *First phase*, that of granular cell, the first stage of this phase being coarsely granular, the second stage finely granular: *second phase*, that of nucleated cell, the first stage of this phase being uncoloured, the second being coloured. He considers that the *nucleated cell*, in its second or coloured stage, passes into the *red corpuscle*, in the fully-formed blood of man and the mammalia, and that the nucleated cell is thus changed into the fully-formed

probable that the assimilation or the organisation of the globules of the chyle, as well as of those lymph-globules, circulating in the lymphatics, either originates in, or is advanced by, the glands in the course of both lacteals and lymphatics; and it may also be inferred that the further organisation of the lymph-globules — both those carried into the blood from the lacteals, and those from the lymphatics — or their conversion into the fully-formed red blood-corpuscles, is owing to the vital operation of those glands which are not provided with excreting ducts; as the spleen, the supra-renal glands, and the thymus, and probably also of the liver. The facts long and frequently remarked by me of anæmia, or deficiency of red-globules, being always the consequence of torpor, enlargement, or other disease of the spleen or liver, favour this view of the influence of these viscera in the assimilation or development of the chyle and lymph-globules into red blood-globules. It may therefore be inferred, from the organisation of the lacteal and lymphatic vessels and glands, and of those non-excreting glands just mentioned — from the circumstance of these organs being abundantly provided with ganglial nerves, blood-vessels, and absorbents, that the fluids carried to, and circulating through them, undergo an assimilation, and that this assimilation amounts to a progressively increasing organisation of the globular constituents of these fluids, — this being the function of the organs now referred to.

82. Organisation thus commencing in the chyle or lymph, as respects the perpetuation of the individual animal, it must necessarily follow that these fluids participate in the vitality existing in the vessels and organs through which they circulate. This vital endowment, whether existing in the fluids as a simple emanation from the containing structures, or actuating them more efficiently through the medium of their globules, is evidently concerned in the phenomena displayed by these fluids, as well as by the blood when removed from the vessels, as I contended many years ago; the changes observed to take place in these fluids, and more especially their coagulation, being the consequences chiefly of the loss of the vitality, or of the organic nervous influence or emanation endowing these fluids. If, therefore, it be admitted — and it cannot be rationally disputed, or with a due recognition of healthy and of morbid phenomena — that the circulating fluids are thus vitally endowed, it must necessarily follow that this endowment is dependent upon, and co-ordinate with, the vitality or the organic nervous energy of the frame; and, farther, that whatever contaminates these fluids must necessarily co-ordinately affect the vitality of the frame through which the contaminated fluids circulate.

83. *B.* Contamination of the circulating fluids may commence — 1st, in the lacteals, through the medium of the digestive canal; — 2nd, in the lungs, through the medium of the respiratory surfaces; — 3rd, in any part of the external surface of the body; — and, 4th, in any part or tissue of the frame, by a self-contamination; and, thus originating, the contamination may manifest itself either generally, coëtaneously, and co-ordinately throughout the frame; or prominently, and especially upon particular organs or parts, other organs or parts betraying comparatively but little disturbance. Of these sources of contamination I shall take a very brief and passing view, as far as they may elucidate the associations of disease.

84. 1st. If the lacteals communicate with veins concurring to form the portal circulation, as some assert, and believe that they have demonstrated, and whether this communication take place before or after they have passed through their glands, or does not take place at all, the injurious influence of a contaminated or unwholesome chyle upon the circulation, and the organs through which it passes, will readily be admitted. If the contaminated chyle passes more directly into the blood circulating to the portal vessels, and without pursuing the longer route to the general venous circulation, it must necessarily follow that the functions and even the organisation of the liver and its vessels, will be placed in great jeopardy; and it may be further inferred that, whatever may be the route which the chyle takes, the globules will not undergo their wonted healthy advances towards complete organisation either before they reach the blood, or after they have entered into it. It is even very probable that the blood, thus abounding in an unwholesome or contaminated chyle, and with imperfectly assimilated or organised chyle or lymph-globules, will disorder the functions, and ultimately the organisation of those structures and organs more immediately concerned in perfecting these globules, or transmuting them into perfect red blood-globules.

85. 2d. The second channel of contamination, or that through the respiratory organs, hardly requires any notice, it being so obviously one through which the most injurious agents are conveyed into the blood itself, thereby infecting or contaminating this fluid, and, through its medium, either remote parts, with which the particular agent may have especial relations, or the whole frame. It is through the respiratory surfaces that the emanations from numerous sources infect the system — effluvia from the soil and its productions, and exhalations from dead animal matters and from diseased bodies; and although this source of contamination and infection is the most obvious to every one who is capable of speculating respecting the causation of disease, especially when considered in connection with the functions of the respiratory organs, yet it has been most frequently overlooked or insufficiently estimated. The blood is affected not only by the physical constitution of the air as respects temperature, humidity, electrical conditions, but also by those foreign gases, vapours, and emanations from living and dead organised bodies existing on the earth's surface. These severally, sometimes variously associated, affect both the vital conditions of the lungs — the organic nervous energy of the organ — and thus directly, as well as indirectly, modify the changes which take place in the blood circulating through the lungs, or otherwise contaminate this fluid in modes more or less specially related to the nature of the causes or agents which operate through this channel. (See art. Infection.)

86. 3d. The *third* or cutaneous channel of con-

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red blood-corpuscle, by the cellæform nucleus of the nucleated cell being set free by the bursting of the cell itself, the nucleus having become filled and red by the secretion of globuline and colouring matter into its interior.

tamination is certainly less frequently influential than those already passed in review. Still all the physical conditions of the atmosphere, and all the foreign gases, vapours, and emanations floating in the air, which so readily and injuriously invade the system through the respiratory organs, also affect the functions of the skin, and thereby the conditions of the blood, and the states of the several internal viscera, and more particularly of the other excreting organs. The most serious contaminations of the circulating fluids, and of adjoining parts produced through the medium of the cutaneous surface, arise from the septic influence of a foul or infected air upon this surface when it is punctured, abraded, or deprived of that protection at any one point which the cuticle or epithelium is destined to afford, or when mucous surfaces, and especially serous surfaces, are exposed to this cause. In these circumstances, the skin itself, in some instances; the lymphatics or veins, or both, in other cases; or the cellular tissue, in some; and even all these, in a few, are seriously affected, and ultimately the blood itself is more or less contaminated; remote parts, and even the whole frame, becoming thereby implicated in the foul, septic, and disorganizing process thus commenced and most rapidly propagated. And here I may advert to the influence of the air in many situations, but more especially in towns and ill-ventilated places and houses, in extending disease originating in, or chiefly consisting of, lesion of the cutaneous surface; and the insufficient attention usually paid in practice to a due protection of exposed points of the cutaneous surface from the influence of the air, and to the exclusion of this fluid from deep-seated injuries or diseases. Nature provides a spontaneous remedy against the endosmosis or imbibition of infectious or contaminating agents existing in the air, by throwing out lymph, which, by coagulating, protects the exposed or injured point or surface; but the powers of life, as manifested by the capillary system, are not always adequate to this effect, and the consequences are the imbibition of septic matters, which contaminate the surrounding tissues and the fluids taken up by the absorbing vessels, and occasion a spreading, or asthenic, or diffusive inflammation of these vessels, of the lymphatic glands, and of the adjoining cellular tissue, the most manifest changes in the blood itself, and not infrequently extensive disorganization of remote organs and parts.

87. The changes thus arising in, and propagated from, the third channel of contamination, sometimes equally originate in and are propagated from deep-seated or internal parts, through the medium of circulating fluids and vessels, to distant situations, where they may be manifested only or chiefly. In the articles ABSCESS, ABSORPTION, BLOOD, DISEASE, and INFECTION, I have fully shown the manner in which morbid secretions or other depositions may contaminate not only the adjoining tissues, but also the circulating fluids, and ultimately occasion disorganization, and the formation of puriform or other morbid collections or lesions in distant organs or parts. I have so fully enlarged, in the places just indicated, on the views and doctrines which these consecutive lesions involve, that I need not allude to them at this place, more especially as they have been adopted by subsequent and recent writers; not always, however, with a due acknowledgment of the original sources.

88. It having thus been shown that the formation and perfection of the chyle and lymph-globules are probably owing to the vital influence of the vessels and glands through which they circulate, and that the metamorphosis of these globules to perfect red blood-globules is due to the functions of the glands not possessing excreting ducts, and of the liver, it necessarily follows that the absorption or passage of injurious, imperfectly assimilated, or other morbid matters into this fluid, must occasion disease in the organs more especially devoted to these functions; whilst impaired function of these organs, or structural lesions of them, must also impede or interrupt the progressive changes of these globules, and the formation of perfect blood-globules; the conditions of the blood itself becoming thus more or less imperfect or diseased, and incapable of undergoing in the lungs those changes which are requisise to the due nutrition of the frame, and healthy condition of the several viscera.

89. What the exact conformation of the several globules existing in the chyle, lpmph, and blood, may be, is not, perhaps, yet fully determined, or, at least, admitted, by the numerous observers who have attempted to investigate the subject. But it may, at least, be inferred that these globules undergo a progressive organisation, and that the organs already mentioned are instrumental in producing it; but it should likewise be considered that the changes produced in the blood in the lungs and in the general circulation, as well as the influence of the air upon the blood, are also more or less intimately connected with the perfection of these globules, as well as with whatever alterations they may undergo subsequently to their full development. Neither microscopic nor speculative physiologists have shown the nature of the relation existing between the atmospheric elements and the blood-globules and other constituents of the blood, so as to explain the phenomena of nutrition and the sustentation of nervous or vital energy. Certain of the more manifest phenomena have been remarked, but not accurately traced or irrefragably demonstrated. It may be asserted that the oxygen of the air combines with the blood-globules, and gives rise to changes necessary to nutrition, to nervous endowment, and even to the circulation of the blood itself. But it is quite as difficult to prove as to disprove this proposition, with the subordinate relations between these globules and the several general systems and special organs which this proposition involves.

90. At the present day, the chemical changes which occur in the blood have become subjects of discussion, and too generally with an entire neglect of those alterations which arise from the states of vital power. The former can seldom be recognised in practice, and are often unappreciable even in the most dangerous diseases; whilst the latter are generally the most manifest and characteristic, and present themselves in this manner to the unaided senses. To these latter, therefore, our attention should be directed, inasmuch as they indicate not merely the states of the blood itself, as respects its more important constituents, but also the conditions of organic nervous or vital power—conditions of the utmost importance to be correctly estimated by the physician. It should

not, moreover, be overlooked that even the most gross and evident chemical changes are merely the results of vital power and vascular action controlling the changes which are imputed to chemical affinities; but which are truly the results of a vital chemistry, or of affinities controlled by vital forces. Whatever may be the nature of the intimate chemical changes which take place in the blood, either in the lungs, or in any other organ, there is every reason to assert, that these changes would not result, if the organic nervous influence were removed from the organ in which they take place in health; and further, a close observation of the causation of the changes observed in the blood during disease, leaves me to infer, that most of those changes are more or less influenced or produced by conditions of nervous energy or vital power, chemical action or affinity having nothing to do with the matter, further than in favouring the combinations of alkaline bases with oxygen, and of these or other compounds with acids; and those combinations even are favoured or controlled by the vital powers.

91. In speculating upon the changes taking place in the blood, the chief places are assigned, as agents, to the oxygen of the air, and to the carbonic acid or its constituents, as existing in the blood. What change, if any, may be affected by the nitrogen of the atmosphere, is not ascertained. It is supposed that azote produces little or no alteration of the blood; yet it is not unlikely that, although the amount may not be appreciated or appreciable — at least there is no admission of appreciation by chemists — there is, nevertheless, a change produced by it, both on the fluids which are carried into, and on the fluids which circulate in the system.

92. *C.* In the various speculations on the changes occurring in the blood in health and disease, until the appearance of the article BLOOD in this work (in 1832), and to which article some more recent writers have been much more indebted than they are willing to admit, the alterations of the blood —*the pathology of the blood*—have been very imperfectly and worse than superficially treated of. And whilst physiologists and pathologists have directed some attention to the processes of sanguifaction, they have altogether neglected to show how *the destruction or waste of the hæmato-globuline or red corpuscles takes place*, so as to prevent, during assimilation and nutrition, an exuberance—a morbid plethora—of this constituent of the circulating fluid from occurring.—*a.* A topic which has not been considered with reference to the healthy state can hardly be supposed to have been investigated in connection with disease. But it cannot be unreasonable to infer, that in health the waste may proceed from the following sources: — 1st, from a partial vital decomposition and conversion of the hæmato-globuline or red-corpuscles to supply by nutrition the waste of the several tissues; 2nd, from the conversion of a portion of the globules in the portal vessels into bile; 3rd, from the action of the mucous follicles, especially of those seated in the lower portion of the small and in the whole of the large bowels, upon the blood conveyed to them; 4th, from the operation of the other emunctories, although in a much less degree, especially the kidneys and skin; the epithelium cells, thrown off by these, being transformed blood-globules, either before or after they had acquired their colouring matter or property; and 5th, from the elaboration of the sexual fluids and discharges in both sexes.

93. *b. During disease*, the waste of the hæmato-globuline or red-corpuscles may be either hastened, increased, or impeded, more rarely the latter. It may be hastened or *increased* — 1st, by insufficient assimilation owing to impaired organic nervous or vital power; 2nd, by morbidly increased action of the liver; 3rd, by increased action or elimination of the emunctories, especially of the intestinal follicles and surface of the skin and of the kidneys, owing to the impaired vital endowment of the globules and crasis of the blood having provided these emunctories with an increased pabulum, or material whereby their actions are augmented; and 4th, by the morbid or increased action of the sexual organs in either sex. Owing to the excessive action of these sources of waste, the blood may become poor or deficient in hæmato-globuline and red corpuscles; and accordingly we find, not only where assimilation is deficient, owing either to inanition or impaired vital power, but also where either of these sources becomes inordinate for any continuance, that a poor state of the blood or anæmia takes place. In low or adynamic fevers, in diarrhœa or dysentery, in some affections of the kidneys, in leucorrhœa, in self-pollution, and in excessive sexual intercourses, in acute rheumatism, especially when attended by excessive perspiration, this state of the blood generally supervenes. As respects rheumatism, this result escaped the observation of previous writers, until I mentioned it when treating of this disease. (See art. RHEUMATISM, §§ 84, *et seq.*)

94. *D.* During the process of circulation, in consequence of the changes that take place in the chyle and blood globules, of the absorption of chyle from the digestive canal, and of effete matters from the several tissues, considerable changes must necessarily take place in the blood, and, as the result of these, numerous phenomena must be produced in, and evinced by, the excreting organs — the skin, the lungs, the liver, the intestinal canal, and the kidneys. There appears to be a very intimate sympathy between the functions of these organs. Many years ago I had an opportunity of putting that subject to the test. In 1814 and 1815, I was engaged in a number of experiments on the effects of temperature upon respiration and the blood in different states of the system, and the results of those experiments were afterwards published. Subsequently when visiting an unhealthy and warm climate, I had an opportunity of observing the changes there produced in the air by the respiration of individuals of different races, and found that, during cold states of the atmosphere, and soon after digestion, the greatest changes took place in the blood,—the greatest consumption of oxygen, and the greatest amount of carbonic acid then appearing in the expired air; while in a very warm state of the atmosphere, and several hours after a meal, when the vital powers are depressed, the smallest amount of oxygen was consumed, and of carbonic acid existed in the expired air; and these latter effects were most manifest when the system was subjected to the influence of malaria. It was also further considered, that the cutaneous function was, to a certain extent, supplemental to the function of respiration; that, in

fact, as observed in some of the lower animals, the cutaneous function is, to a considerable degree, one of respiration. This, even in the human species, appears to be the case, more especially as regards negroes. I made several experiments, in a very warm climate, on the respiratory functions of this race, and found that the quantity of carbonic acid given off from the lungs, in this variety of the species, was almost one-third less than that given off by the lungs of an European of the same size, and at the same temperature; whilst, in the former, the changes taking place on the cutaneous surface were greater in degree, and more extensive in kind, than in the latter, — the supplemental respiratory function of the skin of the negro being not only more remarkable as regarded the formation of carbonic acid and the exhalation of watery vapour, but also peculiar as respected the amount of animal matter and effluvium impregnating the exhaled vapour and watery fluid.

95. I attempted at that time to account for the prevalence of fevers, and disorders of the biliary functions, &c., so prevalent among Europeans migrating to a warm climate, by the state of the blood consequent upon the diminished changes produced by the air on the blood, and by the superabundance of the elements from which bile is formed existing in the circulation; the liver thus for a time performing a vicarious action to the lungs, — the deficient function of the lungs, in an European in warm climates, being made up by the greater activity of the liver. However, this exists in individuals only for some time after they arrive in a warm climate, and very frequently it is not so remarkable after a year's residence there. Active exercise also in a warm climate, by increasing the functions of respiration and cutaneous exhalation, remarkably relieves the increased function of the liver, and prevents many of the consequences of this disorder.

96. There is also a very intimate connection existing between the state of the blood and the depurating offices of the mucous surface of the intestines, especially of the large intestines. This surface, and more particularly the follicular glands, may be considered as eliminating from the blood, redundant or decomposed blood-globules (§ 92.), and much effete materials, and as thereby contributing, with the other emunctories, to the purity and healthy condition of this fluid. The connection subsisting between the functions of excreting viscera, not only as altering the condition of the blood, but also as affecting each other individually,—the influence which the state of one depurating function exerts upon the others, through the mediums of the blood, as well as through that of the organic nervous system, and the mutual and conjoint operation of all these functions, not merely in changing the physical appearances and constitution of the blood, and the states of vital influence, but also in occasioning structural alterations, are amongst the most important topics comprised by a rational system of pathology. Without due consideration being devoted to them, the morbid changes constituting the progressive periods of disease, the media of connection subsisting between affections of distant parts, and the passage of one alteration into another, cannot be traced; and the association of disease of one organ, with equal or even greater disease of another organ, cannot be explained, and neither anticipated nor guarded against in practice.

97. *E.* It is of great importance to the physician to observe closely the *physical appearances or sensible characters of the blood*, when removed from the subject of disease, both immediately upon and some time after its removal. It is hardly possible for him to devote his attention to the analysis or *chemical constitution* of this fluid, inasmuch as this requires considerable time and diversified experiments to arrive at satisfactory conclusions; and, besides, many of the changes observed are truly vital, or at least the results of departing vitality, and are either very imperfectly, or not at all, indicated by chemical analysis or tests, although frequently manifested by distinct physical characters. The physical appearances of the blood, when removed from the body during the life of the patient, are of the utmost importance, as indicating not only the conditions of this fluid *per se*, but also the states of vital power; and as furnishing the chief indications of cure. My limits will not admit of my noticing, otherwise than in very general terms, the principal alterations of the blood, which tend both to associate alterations of distant parts, and even to contaminate more or less the soft solids of the body. The perusal of what has been done by chemists, even down to the present day, to demonstrate the chemical changes of the blood, even in the advanced stages of disease, will furnish but little information which can be used practically, compared with attentive observation of the physical changes of this fluid. These latter changes I have fully described in another place (see article Blood), and therefore I shall not even briefly advert to them now, but merely notice two or three topics connected with the subject more immediately under consideration, some of which have not received sufficient attention from other writers.

98. *a.* Various changes as respects the *colour* of the blood, both at the time of removing it from the vein and afterwards, have been observed. The blood may present every shade of colour, from a pinkish hue, or a pale or florid red, to a deep red, or a brownish or dark red, or dark violet, or even to a brownish or black, or dark greenish hue. The first of these colours is observed chiefly in cases of anæmia; the latter of them in congestive diseases; and the last chiefly in pestilential or malignant maladies, or in cases of poisoning,—indicating not only a contaminated state of the blood, but also impaired organic nervous influence of the vessels and vital organs.

99. *b.* But it is not merely the colour of the blood, but also the rapidity and mode of its *coagulation*, and the *state of the coagulum*, that requires the attention of the physician. The relative proportions of coagulum and serum; the firmness, or the flaccidity or softness of the former; the presence of cupping of the coagulum, or of the buffy coat, and the thickness and density of the buff, are circumstances which will be duly estimated by him, as indications of organic nervous energy or excitement —of states of encreased vascular action and of vital resistance. He will, from these conditions of the blood, infer existing states of the whole vascular system, and of the organic nervous system as actuating the vascular—viewing these conditions as the results of the states of these; and whilst he estimates them all at their true value, he will not

attribute undue importance to any one condition apart from the rest. He will not, as in a case to which I was recently called, after taking away between thirty and forty ounces of blood, again take away nearly as much within a few hours, merely because the latter cupfuls of the former bleeding were cupped and buffed, and thus nearly destroy the patient; but experience will soon show him, if education have not taught him, that, in inflammatory affections of serous or fibrous tissues, and in diseases attended by vascular excitement, without loss of vital power or resistance, or infectious contamination of the blood, the fibrin continuing abundant, the coagulum may present these appearances to the last, and even although it may be relatively small to the amount of serum.

100. But, in different states of the organic nervous influence or vital power, and owing to these states either primarily or consecutively, the blood presents very opposite physical characters. It coagulates more rapidly and more imperfectly, or even hardly coagulates at all, or at least does not separate into any coagulum distinct from the serum. These characters are usually observed in depressed states of vital power and resistance, and in contaminated or poisoned conditions of the blood, and are owing either to absorption of contaminating and morbid matters, or to interrupted depuration by the several emunctories. In some malignant diseases characterised by extreme depression of vital energy, with a rapid state of the circulation, the change in the appearances of the blood has been most remarkable and sudden or speedy in its accession. In the worst form of puerperal fever—a disease which I have seen go on to a fatal issue within twenty-four hours from its accession, and for which blood-letting was often most improperly and fatally employed, because it had been recommended by some dangerous because ignorant writers — the blood has, in some instances to which I was called, subsequently to its abstraction, presented the appearance of a straw-coloured and very thin jelly, without any coagulum, the colouring matter being precipitated to the bottom of the vessel of a black hue, and in the manner of a powder which had been mechanically mixed in the fluid which had suspended it, and without the least cohesion between its particles. In these cases, as well as in some other maladies characterised by extreme depression of vital power, and a poisoned state of the blood, the coagulation is not only imperfect, but is of a peculiar kind; the colouring matter being detached from the other constituents of the blood almost as soon as the blood passes from the vein, the fibrinous elements forming a thin jelly with the serum of the blood. The small amount of vitality possessed by the blood in these cases, is lost immediately upon its abstraction from the body; and the fibrin, although it may exist in tolerable quantity, is incapable of contracting or adhering so as to form a coagulum, yet often uniting so loosely in the serum as to form a thin gelatinous mass.

101. *F.* The *quantity* of blood in the system has also a very important influence in associating diseases of distant organs or parts; and this influence becomes still greater and more general if the blood either abound in excrementitial elements, or be in any way poisoned or contaminated. The quantity of blood may be diminished as respects either the general amount, or the colouring constituents, or hæmato-globuline; and it may be deficient in a single organ. It is not unusual to observe in cases of general anæmia an irregular distribution of the blood, some organ or part experiencing an excess, whilst the diminution is still more remarkable in other parts. This is usually observed when, with anæmia, there exists local irritation, or excitement of the organic nervous influence of a particular organ. In this way distant parts often present consentaneous morbid phenomena, and the organ which has received to-day a more than proportionate supply of that blood which is deficient either in general amount, or in colouring matter, or in fibrin, or in all these together, may present on the morrow more than usual deficiency; and thus a new combination of disorders may arise. This is not unfrequently met with in nervous, susceptible, and hysterical persons, in whom the distribution of blood is always more or less under the control of the nervous system, more especially the ganglial.

102. If the influence of these states of the circulation be remarkable in associating disorders of distant parts, that produced by the opposite state, or too great fulness, is not the less so, more especially if the fulness be attended by an excess of effete or excrementitial elements. Vascular plethora, as long as the blood is duly changed by the emunctories, favours active determination to particular organs, especially to those liable to irritation or nervous excitement, — not infrequently also to acute inflammations and active hæmorrhages, according to the diathesis and the nature of exciting or concurring causes. But if excrementitial fulness supervene, owing to the imperfect discharge of some depurating function, as that of the kidneys, some distant organ is placed in great jeopardy, or effusion takes place in shut cavities, or in the cellular tissues. But these results may equally occur although the amount of blood in the system previously had been in due relation to the frame, and to the capacity and state of the vascular system. It frequently is observed in practice, that a previously healthy person, in respect of his vascular system especially, is exposed to causes which arrest the cutaneous excretions, and he experiences a slight attack of fever, or local determination to some predisposed organ, or diarrhœa, or some other affection, especially if the kidneys have not performed a vicarious office in supplying the suppressed function of the skin. A healthy person, also, is exposed to causes, as infections, which depress organic nervous energy, and thereby impair or suppress the more important depurating and secreting functions. The consequences as respects the blood are obvious. This fluid soon abounds in effete and injurious elements, increasing both the amount of vascular contents, and oppressing and irritating the whole vascular system, although certain organs may manifest these effects in a more prominent manner than others, until a salutary crisis is observed, and the morbid state of the blood is removed; or until the soft solids are changed, their vital cohesion is loosened, and disorganisation ensues.

103. *G.* I need not pursue this subject further, seeing that I have fully discussed it in several parts of this work; but I wish to direct attention to one topic more particularly connected with it, and

which, in its relations to various maladies, has been most unaccountably overlooked — namely, to the probable want of correspondence, on some occasions, between the capacity of the vascular system and the amount of its contents, between the area of the containing vessels and the amount of fluids contained. — *a*. This presumed want of adaptation, or of accordance, may be great, quite irrespective of the quality or condition of the circulating fluid; the tone of the containing vessels being so remarkably deficient, owing to depression of the organic nervous power, as not to occasion the due accommodation between the vessels and the blood circulating in them — as not to admit of that amount of vital contraction and adaptation of the vessels necessary to the due performance of the circulation, and to the retention in them of the more fluid parts of the blood, which, either alone or with more or less of the hæmato-globulin, readily escape from the relaxed capillaries in the more yielding surfaces and erectile tissues. Now, a due correspondence between the containing vessels and the contained fluids, and the mutual influences both vital and mechanical resulting from this correspondence, and from the healthy conditions of both the vessels and the fluids, are obviously wanting, in a more or less remarkable manner, in many maladies, especially in several malignant and pestilential fevers, more especially where the vital powers are remarkably depressed; and it is chiefly owing to this depression that the vascular system is incapable of accommodating itself to the amount of its contents. In these circumstances the pulse is at first broad, open, soft, and compressible, although it is subsequently small, feeble, creeping, or undulating; and the abstracting of even a small quantity of blood, or the loss of it by the passive hæmorrhages or exudations, which often occur very rapidly, sinks the patient, by increasing the want of correspondence, now pointed out, between the capacity of the vessels and the amount of blood they contain.

104. *b*. This want of correspondence, or of vital accordance, between the bloodvessels and their contents, may arise also from a different pathological condition, namely, from the blood being so deficient in quantity, as not to impart the requisite state of *tension* to the coats of the vessels: and hence, when the vital tone of the vessels is impaired at the same time that the blood is deficient in quantity, the current of the circulation is irregular and languid; and vascular action, which was already asthenic when the vital tone of the vessels was impaired, becomes much more asthenic when the blood is also deficient in quantity, fatal congestion and sinking of the vital powers ultimately supervening.

105. In pestilential maladies, and even in other malignant diseases, the tendency to death is to be imputed as much to this increasing want of accordance, — to the progressive defect of vital and mechanical adaptation, between the vessels and the blood, as to the changes which have actually taken place in the constitution of the blood; and several of the associated phenomena, characterising the advanced and last stages of these maladies, are to be ascribed to this circumstance, — to this pathological condition existing so generally throughout the vascular system. Thus, in the hæmagastric pestilence, or true yellow fever, the phenomena observed in its progress, and the acceleration of death by passive hæmorrhages, or the black vomit, in its last stage, are readily explained according to this view; whilst the more successful mode of treatment for this malady is that which is directed to these changes in the vascular system, and to the state of organic nervous influence upon which these changes originally depend.

106. That this want of accordance between the amount of blood in the vessels and the capacity of the bloodvessels, this deficient vital adaptation of the vessels to the amount of their contents, is a most important pathological condition existing in the progress of several malignant diseases, and associating the affections of distant organs; and, moreover, that death in these diseases is to be imputed rather to this circumstance, to this condition, than to the poisoned or altered constitution of the blood, heightened as it often is, at an advanced stage, by passive hæmorrhages, are facts illustrated by the course of several maladies, and demonstrated by what is observed after death from hæmorrhages and from hæmagastric pestilence. In the last stage of this latter malady, and as the altered blood — altered as regards its vital condition, physical appearances, chemical condition, and in the loss of the greater part of its fibrin — exudes from the mucous surfaces and outlets, the circulation becomes remarkably slow, the vessels appear and feel soft, relaxed, flaccid, and imperfectly filled; the blood returns to the right side of the heart in deficient quantity and celerity; absorption of fluid from the digestive organs is arrested; and ultimately the heart's action ceases, from an insufficient return or supply of blood to the right auricle. Upon examination after death, the digestive canal contains much black grumous matter, consisting chiefly of altered blood, or of matters similar to those thrown off from the stomach and bowels for some time before death; the abdominal vessels, and especially those contributing to the portal system, the ramifications of the vena porta, and the hepatic veins, are empty, and the liver is remarkably pale. The whole vascular system is deficient of blood. Analogous changes characterise the last stage of other maladies, as pestilential cholera, plague, &c., the chief difference being, that, in the former especially, the watery parts of the blood are those principally lost, the parts which are left being not only insufficient for the maintenance of a due correspondence between it and the vessels, but also unsuited to capillary circulation, and to the sustentation of the vital functions; the soft solids being also more or less deficient in vital cohesion, and rapidly passing into dissolution, as I have shown on several occasions, and especially when treating of these maladies.

107. *H*. It being admitted, and the fact cannot be disputed, that changes in the quantity and quality or state of the blood, and, still more remarkably, changes in both quantity and quality, associate disease of several organs, both those intimately connected anatomically, and those more distantly related physiologically, it must necessarily follow that not merely functional disturbance of these several remote as well as proximate organs is thereby produced and associated, but also structural changes and the most extensive disorganisations of these organs often result. But it is

not sufficient for us to take for granted these changes in the blood and vascular system, in thus complicating or associating disorders and distempers, and in developing various sympathetic ailments: it is of importance to us to trace these changes to their sources, and to view their relations, in order that we may the more fully comprehend their extent, and hence be enabled the more satisfactorily to prevent their accession, to arrest their progress, or to counteract their effects. I have already pointed out, briefly and inadequately, several of these sources and their pathological relations, and referred to the parts of this work where these topics are more fully discussed, and therefore I shall now merely enumerate the several conditions to which attention should be directed in our investigations of the sympathies or the morbid associations and complications resulting from alterations of the blood and vascular system.

108. *Firstly*, the state of organic nervous influence in relation to the agents affecting it, and to the resulting influences and changes upon the vascular system and blood.

109. *Secondly*, imperfect chymification and chylification, owing to the unwholesome nature of the ingesta, or to impaired digestive function, or to morbid states of the digestive mucous surface; the chyle being either imperfectly elaborated, or of so unhealthy a constitution, as to affect the glands and viscera through which it circulates whilst passing onwards to the blood, and after it has mixed with this fluid.

110. *Thirdly*. The absorption of morbid secretions, excretions, or other matters, either from the digestive canal and mucous surfaces, or from cellular parts, or parenchymatous organs or other structures, these matters often inflaming the blood-vessels or the absorbents and glands, contaminating the blood, producing chronic or hectic fever, irritating or inflaming remote vessels and organs, or giving rise to abscesses or purulent deposits, diffused or encysted, primary or secondary, in distant parts, as more fully shown in the articles "*Abscess,*" "*Absorption,*" "*Blood,*" and "*Disease,*" in this work, and in my paper on the "*Pathology of the Veins,*" in the MEDICAL GAZETTE.

111. *Fourthly*. Suppression, interruption, or diminution of any of the eliminating or depurating functions—of either of the excretory actions, by which effete materials are removed from the blood, and this fluid is preserved in a healthy condition; interruption of one or more of these functions, altering the state of the blood, changing the healthy relations subsisting between it and the heart and vascular system generally, disordering the other excreting organs, exciting general vascular disturbance, and superinducing various changes, contaminations, effusions, and even disorganisations in several organs or parts, or generally throughout the frame.

112. *Fifthly*. The exciting, or depressing emotions of mind,—all influences, excitants, or agents, affecting either the cerebral, or spinal, or the ganglial sensibility—all inordinate excitations of the mind, passions, or sentiments; or of the senses and muscular movements; or of any of the organs requisite to the continuance of the life of the individual, or the perpetuation of the species, are liable to be followed by sympathetic disorder of distant but related parts, owing to the organic nervous connections already pointed out, to the changes frequently produced in the fluids—the chylous, lymphatic, and sanguineous—to the consecutive changes of nervous power, and electro-motive conditions of the general systems of the body, and to the *unity*, as well as to the special systems and conditions, of the frame.

113. From one or other, or from two or more, of these, numerous associated morbid conditions result, some of which conditions have been variously estimated and classed, with the narrow but vain view of giving them the individuality and identity displayed by the genera and species of the animal and vegetable kingdoms, characteristics which they are altogether incapable of evincing, owing to the diversified features, associations, and complications resulting from these five great sources, and their innumerable states, modifications, and progressive changes. The most common, at the same time the most uniform of the special results, proceeding from these sources, the most frequent of these sympathetic associations and morbid complications, in which changes throughout the whole frame are most remarkably produced, and most intimately dependent upon each other, through the *media* especially of the organic nervous system, and of the vascular system and blood, are the following:—

114. 1st. Sympathetic or symptomatic states of vascular excitement or action, resulting from changes in the organic or cerebro-spinal sensibility of parts; or from local injury, or from inflammation, pressure, or other local changes,—*symptomatic fevers*. The media of general disorder in these are, firstly, the nervous systems, and consecutively the vascular system and blood, the several concomitant and intercurrent changes, varying in different cases with the nature of the causes, and the numerous circumstances connected with these causes, and with the individual affected.

115 2ndly. Chronic or hectic febrile conditions, resulting generally from a persistent source of irritation implicating primarily the organic nervous function, and consecutively changing the nutrition and secretions of the part, and ultimately altering the states of vascular action and of the blood; followed frequently by absorption of morbid or puriform or tubercular matters into the circulation, by consecutive deposits, abscesses, &c. *Hectic and chronic fevers*, consequent upon local irritations, tubercular deposits, encysted abscesses, carious bones, and malignant formations, &c., are all of this description, and are ultimately accompanied by altered conditions of the blood, imperfect assimilation, anæmia, &c.

116. 3rdly. Periodic fevers, or febrile and painful states of the system, arising from malaria, and varying in character with the concentration of the effluvium, and with the proportion or amount of emanation from dead animal matter which is conjoined with it. The morbid impression in these diseases is made primarily upon the organic nervous system, the vascular system and blood being consecutively affected, and various visceral affections often ultimately resulting.

117. 4thly. Adynamic, typhoid, and putrid fevers, or those arising from the emanations proceeding from living or dead animal matter. The morbid impression is made by those emanations primarily and principally upon the organic nervous system, although the blood may also be primarily con-

taminated, as it obviously is consecutively, the soft solids generally becoming, through these media, ultimately more or less implicated.

118. 5thly. Exanthematous and pestilential fevers, or those fevers arising from specific morbid poisons. The morbid impression is generally made in these distempers in ways similar to those now stated, §. 117., and the results are equally general and serious, often most rapidly fatal, particular fevers presenting peculiar characters.

119. In all these maladies, although the organic nervous system, in the usual mode of exposure to these exciting causes, receives the first morbid impression, especially when the poison is inhaled with the air into the lungs, the blood soon becomes contaminated, owing either to the absorption of a portion of that poison, or to the influence of the primarily induced morbid condition of the organic nervous system, in impairing the several secreting and excreting functions, and in altering in this way not merely the healthy constitution of the blood, but also the vital adaptation of the vascular system generally and of the amount of blood to each other; and, moreover, in destroying, both by the primary impression on the organic nervous system, and by the consecutive effects, the vital cohesion of the several simple tissues, structures, and compound organs.

120. These several classes of disease, whether viewed individually or in the aggregate, remarkably illustrate the great extent to which not merely functional disorder, but structural disease, and even more or less general disorganisation, may be associated, when a poisonous influence impresses any one portion of the congeries of ganglia and plexuses constituting the organic nervous system, or contaminates the circulating fluids; the effects being the more rapid, the more general, and the more fatal, the more concentrated or intense the poison, and the more unequivocally and immediately the primary changes are produced, both in this system and in the blood and vascular system.

121. The influences affecting the circulating fluids may therefore be classed under four heads: *first*, that of the nervous systems, more especially the organic nervous influence; *secondly*, the state of the chyle resulting from the nature of the ingesta; *thirdly*, the absorption of morbid or poisonous matters into the circulation, from any surface, organ, or part; *fourthly*, interrupted excretion.

122. Important and extensive changes are produced on the blood by the several eliminating organs, by the liver, the digestive mucous canal, the respiratory surface, especially the lungs, the skin, and the kidneys. An interruption to either or several of the functions of these organs, more or less alters the circulating fluids; but when the constitutional powers are not materially affected or depressed, a slight interruption to the discharge of one excreting function is very frequently followed by vicariously increased action of another excreting function, and thus the system is preserved without experiencing much detriment, in many cases of such interruption.

123. *I.* The importance of considering the state of the blood, with reference to the causes affecting it, is remarkably great, particularly with reference to fevers. In the different forms of fever, where disorders of function, and ultimately structural changes in the organs themselves, become the most extensive, it is seldom that we find one organ implicated alone, but several in rapid succession, or contemporaneously. Inflammatory lesion of a particular tissue or organ, with which the system sympathises through the channels pointed out, namely, nervous organic influence, the blood, continuity and contiguity of surface or structure, implicates the whole frame. The functions of the most remote organs become affected thereby, and generally, in proportion to the extent to which the circulating fluids are disordered. If vascular action, and especially if the circulating fluids be materially affected, coordinate disorder of the urinary and digestive organs, and also of the functions of the brain, generally ensues. Owing to the bonds which unite the frame into a whole, and intimately associate all the viscera, it has been supposed that all fevers are merely the general or sympathetic disturbance of this whole, arising from a more or less prominent affection of one organ. Several writers have attempted thus to localise all forms of fever; and to consider them merely as modifications of inflammatory fever; but I need not allude to these attempts, as they have been disproved when treating of the pathology of fever.

124. It would be interesting, if space allowed, to trace the manner in which the several systems of the frame become affected during the progress of fevers. In respect of periodic fevers, or those which arise from malaria, it may be briefly remarked, that the causes producing them seem to affect primarily and especially the organic nervous system; and that the fluids and abdominal viscera become more or less disordered secondarily. Intermittent and remittent fevers may not appear until weeks after the individual has been exposed to malaria, and then the paroxysms occur at intervals. We know that morbid impressions, or irritations, or other morbid conditions of nervous parts, usually assume a periodic character. If it were the blood which is primarily affected in these cases, it must follow that the state of the blood which existed during the paroxysm would continue during the intermission, until removed; and that, instead of presenting intervals when comparatively little disorder is felt, the disease would be continued; for, in proportion as the blood becomes affected in fever, so does the disease assume a more and more continued type. There are various lesions prominently affecting particular organs, and which give fevers a variety of character: thus we have gastric fever, intestinal fever, bilious fever, and so on. If we proceed to the consideration of the worst forms of fever,—for instance, typhus, or pestilential fever,—not only is the nervous system affected, the organic nervous system being probably the first to be impressed with the cause of the disease; but also the blood itself soon becomes more or less contaminated and altered — becomes physically changed.

125. Now the question is, whether this change, produced so early in the blood in typhoid and pestilential fevers, arises primarily from the absorption of the cause into the blood, or whether it proceeds from the morbid impression made primarily on the organic nervous system, owing to which impression the excreting or depurating functions, which are under the influence of this system, are impaired or arrested, and the circulating vessels and fluids become thereby affected,

and ultimately changed? I have shown how copiously the vascular system is supplied by the organic nervous or ganglial system, and hence we may expect, *à priori*, that causes affecting this system will, to a co-ordinate extent, affect the vascular system and the fluids circulating in the vessels. We find that, in the progress of fevers, the blood becomes changed; and the change may arise partly from the impression made by the emanations causing the fever upon the organic nervous system, and partly from the absorption of the emanation — of the morbid poison itself—into the circulating mass. I believe that the infecting or morbid effluvium being received into the lungs with the air, injuriously effects the organic nervous system supplying these organs; hence the blood in the lungs is not sufficiently changed by respiration. Possibly, also, partial absorption of this effluvium may take place into the blood itself; but if it does not, there is a still stronger reason to infer that the morbid impression extends throughout the organic nervous system, impairing or otherwise altering the influence of this system upon the vascular system, and in the secreting, assimilating, and excreting viscera. The organic nervous power being depressed, it naturally follows that the organs supplied by this system become impaired in function; and hence we find that, in the first days, or within the first twenty-four hours of fever, the functions of the excreting organs are very remarkably diminished, or even suppressed, and the consequence is, that the blood, which may have been hitherto unaffected, is more or less changed; or, if it have been already affected by the cause of the disease, or by the impression on the ganglial system, becomes still further changed. Thus the one change reacts on the other, and promotes it, until at last the changes in the organic or vital nervous influence, in the vascular system, and in the circulating fluids, become so great, that the blood is not only altered sensibly as respects both its physical characters and its chemical qualities, but the tissues and organs themselves become more and more disorganised, or evince a remarkable loss of their natural vital cohesion, especially in putro-adynamic fevers and in distempers of a malignant character. This subject is so fully illustrated in the articles BLOOD, DISEASE, INFECTION, FEVERS, and PESTILENCE, that it is unnecessary to pursue it further at this place.

126. ii. *The influence of obstructed circulation through, or of other lesions of, the heart itself, independently of any material change in the constitution of the blood in complicating diseases*, and the intimate connection existing between the circulation through the heart and that through the lungs, have been already adverted to; but so much have we been in the habit, in consequence of the modes of teaching and writing generally adopted, of viewing disease nosologically, and of regarding one species as being altogether distinct from another; and so injuriously has this acted in the practice of medicine, that we have been thereby actually prevented from seeing the connection subsisting between different diseases, and of observing how intimately they are associated, and how readily the disorder of one organ induces, or passes into, that of another, until experience and repeated observation have destroyed the impressions of erroneous education and of false precepts. We often observe persons with short or hurried respiration on the least exertion, which has often been considered as a form of asthma, and the disease has been looked for in the respiratory organs. The patient has been said to have spasm of the bronchi or the trachea, or some disorder of the respiratory passages, which has produced this disordered respiration. But now that we have traced out more intimately the relation of the disorder of one organ to another, we have found that in these cases the lungs may be free from disease, further than congestion arising from interruption to the circulation through the heart; and we have discovered that, in the majority of such cases, the lungs are only secondarily effected, and that the heart is primarily in fault. This condition of the respiration is most frequently owing to this cause, even where there is but slight disease in the heart. Thus in weakened, nervous, and susceptible persons, the affection of either organ soon extends to the other. If the lungs are disordered, the heart becomes affected; or if the heart is primarily affected, the lungs become disordered — the least excitement of one organ extends to the other. In many persons of lax fibre, or of a lymphatic or leuco-phlegmatic constitution, the parietes of the heart are deficient in tone, or are partially changed in their intimate structure, and dilatation of the cavities, or other alterations, often take place, so as to give rise to imperfect or irregular or interrupted circulation and consequent congestion, with or without effusion, either in the vicinity of the congested viscera or in more distant parts; *the subordinate circulating apparatuses, or the subordinate orders of the vascular system, namely, the vascular apparatuses of the liver, brain, and lungs, especially suffering derangement.* Numerous instances present themselves in practice of consecutive affections, of a complicated character, appearing as the disease advances, during hooping-cough, dry catarrh, asthma, &c.; the heart, the brain and spinal cord, and their membranes, the portal circulation, &c., becoming secondarily affected, in addition to organic changes, often also produced in the lungs themselves, and in their investing membranes.

127. The connection subsisting between dilatations, often slight, of one or more of the cavites of the heart, and betwen lesions of the valves and orifices, and congestions of the subordinate orders of the vascular system just specified, more especially those of the lungs, liver and brain, is sufficiently obvious, particularly when the heart betrays any of these lesions. But there is every reason to infer that congestions of the lungs may actually take place to even a fatal extent, without any very obvious organic lesion of the heart, or lesion of such an extent as can account for the occurrence. Thus severe shocks to the nervous system, mental or physical, severe injuries of vital parts, and agents acting with great intensity, and either inordinately depressing or exhausting vital power, occasion remarkable congestion of the lungs, sometimes also of the other subordinate orders of the vascular system, more especially in persons already the subjects of a fatty, dilated, or relaxed state of the parietes of the heart's cavities. Congestion of the lungs, however induced, even in slighter grades, is a serious morbid condition, inasmuch as it arises

from, or is connected with, various other lesions, either of vital action or of structural change, especially of the parts now stated; and as it generally leads on to further alterations, to inflammatory action, to hæmorrhages, and various organic lesions, especially when neglected or improperly treated.

128. iii. *The sympathies between states of the circulation and those of the digestive organs* are so obvious as hardly to deserve notice. The functions of digestion and assimilation languish when those of circulation and respiration are impaired; and when the respiratory, and especially the circulating actions, are morbidly excited, distaste of food, nausea, thirst, and costiveness are common consequences. In these circumstances the digestive villous surfaces become injected or congested, and the vascular disorder is often imputed to, instead of being viewed as causing, this change. Wherefore, it may be asked, are these surfaces often so prominently affected in cases of general vascular excitement? Because the vascular excitement does not always extend to the portal circulation, and the return of blood from the related viscera through the portal and hepatic veins is not so rapid and complete as the circulation through the arteries supplying the digestive canal; hence the congestion in many acute and chronic diseases of the digestive villous surface, and the rapid disorganisation often consequent upon it, especially when organic nervous power is depressed, as in malignant or pestilential fevers, in gastric remittents, and in typhoid, adynamic, and intestinal fevers.

129. The liver also often experiences consequent congestion or other disorder when the general circulation is either much accelerated, as above, or much impeded, as in cases of cardiac or pulmonary disease. The frequent occurrence of congestion of the liver in the course of these and other maladies, especially of those affecting the organic nervous influence, is a matter deserving notice. This congestion may be, in a great measure, owing to the circumstance of the circulation through the portal vessels being almost entirely removed from the influence of the heart. The circulation through these vessels appears to be owing to the organic nerves which supply them, and when the influence of these nerves is depressed, the circulation in the liver is co-ordinately impaired or impeded. I believe also that the capsule of Glisson is also very influential in promoting this circulation, and this capsule is abundantly supplied with soft ganglial nerves, whereby the vital action of the portal vessels is reinforced with nervous influence. In all cases where there is cardiac disease, and congestion of the lungs consequent upon it, there is generally congestion of the liver. Both organs are intimately associated by means not only of the vascular system and the circulating fluids, but also of organic nervous influence, both organs being supplied by the same class of nerves. Again, the circulation through the liver, to which I have already partially adverted, is very much influenced by the state of the fluids and matters absorbed into the circulation even from the stomach itself, but principally from the intestinal canal. Stimulating, irritating, or imperfectly assimilated matters, when carried into the portal circulation, must necessarily irritate or excite the liver, and thereby ultimately produce changes of its structure.

130. iv. *The sympathy existing between the cardiac and pulmonary circulation and the brain* need only be mentioned to be admitted. The effect of disordered circulation through the heart upon the brain is a matter of very great importance, and one which, until recently, has not been sufficiently adverted to. The subject, however, has been fully discussed in the articles on Apoplexy and Diseases of the Heart, where it was shown, that a number of cases of congestive apoplexy, of hæmorrhagic apoplexy, and of palsy, are occasioned by interruption to the return of blood from the head, owing to lesions of the parietes of the heart's cavities, or of the valves and orifices of the heart, with or without congestion of the lungs, according to the side of the heart in which the primary lesions are seated. This is a complication of very great importance, inasmuch as the symptoms are usually referred to disease of the brain, and are often considered premonitory of apoplexy or palsy, and are often treated as such without reference to the state of the heart, the pulse being tolerably regular; and yet, on examining the heart by auscultation, serious disease of this organ is found. I have had many patients who have long complained of symptoms referable entirely to the brain, the heart betraying to them not the least disorder, and yet in this latter organ was seated the primary, and often the most extensive disease.

131. Owing to insufficiency of the valve, or to dilatation of the right aurico-ventricular orifice, or to what is a still more rare occurrence, to disease of the valves at the commencement of the pulmonary artery, occasioning obstructed circulation, there is regurgitation of blood from the ventricle into the auricle, and then a series of changes supervene, as respects the circulation not only in the brain, but also in the liver and kidneys. At first, lesion of the functions of these organs, or of one of them in a more prominent manner, is observed, with more or less remarkable congestion; and subsequently structural change, with either serous or sanguineous effusion, anasarca, hæmorrhages, &c. The blood being partly thrown back at each contraction of the ventricle into the auricle, the regurgitation into the vena cava superior and inferior occasions congestion of the brain, liver, and kidneys, and its consequences, as just assigned. When there is dilatation of the right auriculo-ventricular orifice, or insufficiency of the valve, the effect upon the venous circulation is made manifest in the pulsation of the jugular veins, and the consecutive lesions just mentioned soon supervene. I have observed these associated changes in the cases of three eminent medical men who were under my care, and in two of whom I had an opportunity of making a post-mortem examination.

132. When these lesions occur in the left side of the heart, and which situation is much the most frequent, they interrupt the circulation through the lungs: congestion of the lungs takes place, and, in consequence of it, I have seen the changes supervene that I have now mentioned with reference to the right side of the heart. The congestion is usually to a great extent, and there is either effusion into the pleural cavities, or hæmorrhage of the lungs, or pulmonary apoplexy. There are other associated changes which require merely to be mentioned, but I shall allude only to organic diseases of the heart and kidneys. When treating

in the article KIDNEY, on granular degenerations of this organ, I fully showed that they were the results of a cachectic inflammation of the secreting structure of the kidney, especially of the Malpighian tufts, consequent upon a morbid state of the blood, and were sometimes also connected with organic changes in the heart and other viscera.[*]

133. In briefly adverting to *the association of disorder of the circulating, nervous, and muscular systems*, I need only remark that, when the chyle or blood is disordered, these other systems are all more or less affected—the muscular system chiefly, through the medium of the nervous. Irritation of lymphatic or lacteal vessels, either at their origins, or by the fluids which they imbibe and transmit, affects the glands through which they pass, or in which they terminate. When the lacteals are irritated, especially at their origins in the small intestines, the irritation is often propagated to the mesenteric glands, or to the portal veins and liver. Indeed, the digestive mucous membrane is seldom affected, especially in children, without causing disease of the mesenteric glands, particularly if the malady goes on to ulceration. It has been believed that, not only under these latter circumstances, but also in chronic dysentery, more especially as it occurs in warm climates, the consecutive abscess of the liver, frequently met with, is not merely owing to the absorption of morbid matters, purulent or acrid, from the digestive mucous canal, which irritate or inflame the liver or its vessels, but is actually the result of a true phlebitis, commencing in the veins of the mucous surface, and propagated along the veins contributing to the portal system, and thence to the ramifications of the vena portæ. In disordered states of the blood, when this fluid becomes vitiated, not only the muscular system, but the joints are also often affected. I have already hinted at this connection, as arising from the circumstance of the ganglial nerves not merely supplying the blood-vessels of the extremities, but also being distributed to the joints, in the vicinity of which they form minute ganglia; and hence, when the organic nervous system is much depressed or weakened, there is always great weakness of the joints. In this way may various phenomena that occur in many diseases be explained. Thus, gout and rheumatism arise not merely from the morbid condition of the blood, but also from the state of the organic or ganglial nerves supplying those parts, and from the connection of these nerves with the cerebro-spinal sensory nerves.

134. V. SYMPATHIES OF SENSATION AND SENSIBILITY, OR ASSOCIATED STATES OF MORBID SENSATION AND SENSIBILITY.—After my endeavours to point out the intimate association of the ganglial with the spinal nerves and nerves of sense, it will be unnecessary to revert to the channel of communication in the associated affection of this class. It is only requisite to notice certain of these associations. Owing to the intimate connection of the fifth pair of nerves with the nerves of sense—with the optic, lingual, auditory, and olfactory—a change affecting the roots or trunk, or even the ramifications of the fifth pair of nerves, to a certain extent impairs one or more of the senses on that side on which this nerve may be affected or implicated. Thus, in cases of tumor or abscess pressing upon the gangliated portion of the fifth pair of nerves, not only is the sensibility of the surface affected, but also the circulation and secretions of the organs of sense on that side are either disordered or impaired. Inflammation of the conjunctiva readily supervenes, and the senses of smell and taste are affected partly in consequence of diminished secretion from the surfaces of their respective organs. All the functions of sense are more or less affected, not only by disease implicating associated nerves, or parts from which the nerves take their origin, but often also by disease in distant situations. Even depressed

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[*] The article KIDNEY was published in 1840, and since the publication of that article views entirely identical with those which I then stated and illustrated have been brought forward by some very recent writers, as previously unpromulgated by any other. I think it therefore due to myself to state, and to refer to the parts and the *sections* of this work, and to the *dates* where my statements as to the topics connected with albuminous urine and granular disease of the kidney, or *Cachectic Nephritis*, as I have termed this disease, may be referred to; the granular degeneration being the advanced stage of the cachectic inflammation. In 1832, I stated, when describing the states of the urine in connection with dropsies, that "renal disease may exist without the urine being albuminous; and the urine may be albuminous without the kidneys being particularly implicated." Also, that I have often found the urine albuminous in the acute diseases of children, where no alteration of the kidneys existed; and that this condition of the urine is frequently observed after the exanthemata. (*See Art.* DROPSY, §§ 34—36.)

When treating of the Diseases of the KIDNEY, in 1840, I entered very fully on the consideration of the pathology of the changes, which, when advanced, have been called "granular degeneration" of this organ; and showed that these changes, and consequently this degeneration, depend upon, or are intimately connected with, a morbid state of the blood; that, therefore, this particular disease of the kidney should be called, "*Cachectic Nephritis, Nephritis Cachectica; or Nephritis Sociata, associated or complicated Nephritis; or Nephritis from constitutional vice; or Nephritis from a morbid state of the blood, or Inflammation of the Malpighian bodies or tufts,*" rather then the appellations conferred on it. (*See the Synonymes adduced under this head.*) And conformably with this doctrine I have defined the disease, *pathologically*, as follows:—"*A morbid state of the blood, characterised chiefly by the presence of urea and deficiency of albumen and of hematosine, in connection with lesion of the circulation in the minute glandular or Malpighian bodies and structure of the kidneys, with various organic changes in other viscera, and generally with serous effusion into the cellular tissue and shut cavities.*" (*See Art.* KIDNEYS, § 81.)

I afterwards proceeded to investigate and to describe various topics connected with the pathology, complications, and treatment of this malady, especially the particular tissue of the kidneys primarily affected; the connection subsisting between this disease and morbid states of the blood; and between it and other visceral maladies, and the origin of the changes of the blood, on which this disease of the kidneys is consequent (*see* § 82). I next described the physical appearances and states, and the chemical changes, of the blood in the several stages of the acute and chronic forms of this disease (§§ 93—97.); and afterwards noticed the sources and causes of this state of the blood (§§ 140, 141.). I would most particularly refer to *par.* 142. of that article, where the reader will find this topic explained, and the reason of both kidneys being always affected in Cachectic Nephritis.

Now Dr. FINGER, of Prague, Dr. WALSHE, and Dr. GEORGE JOHNSON, have, long after the publication of the article on the diseases of the kidneys, adopted my views as to this malady, without any reference to them whatever; Dr. FINGER stating that "the blood is first diseased;" and Dr. WALSHE (*Lancet*, July, 1849) that the lesions of the kidneys are the consequences of previous alterations of the blood. Still more recently, Dr. GEORGE JOHNSON, in his Gulstonian lectures (*see Medical Times and Gazette* for March and April, 1852), has adduced the same doctrine of the origin of this disease; and I am therefore entitled to conclude, that the adoption of my views, and of the results of my investigations, by these very able pathologists, is a strong confirmation of their general accuracy. The several associations and complications of this malady, in connection with the progressive changes of the blood and of the kidneys, were more fully described in that part of this work than they had previously been.

energy of the organic nervous system generally, and especially of those parts of it which preside over digestion and assimilation, impairs the functions of sense. This association of remote organs — this unity of the frame — is displayed not only by one class of functions, but by all the manifestations of life in the different organs constituting the individual living being. I need not advert to the association of morbid sensibility of different parts of the cerebro-spinal nervous system. We are all aware that, when irritation exists at the origins of nerves, it is not there that we may expect to find sensibility principally affected. When the irritation even is greatest at the roots of the nerves, little or no pain or alteration of sensibility may exist there: it will be felt chiefly at the sentient extremities of those nerves. This is manifested by *tic douloureux*, in which the morbid condition exists near the base of the brain, or is connected with the duramater, or is caused by exostosis of some portion of the bones of the cranium. There may be pressure, or irritation caused by ossific deposits, but the morbid change is evinced principally at the remote or distal extremities of the nerves.

135. The same circumstance obtains with regard to the spine. In cases where the individual may not suffer the least uneasiness in the seat of pressure, or in any part of the spine, yet there may be extreme pain in the surface of some part supplied by nerves from that portion of the spinal cord which is implicated in the existing irritation or other change. Although the patient may not feel pain in the part especially affected, yet he may be suffering under inflammatory irritation, or congestion, or other organic changes implicating the spinal cord and membranes or the roots of the nerves. The suffering experienced in the extremities in gouty persons is not always owing to the changes in the extremities only, but partly also to congestion of the venous sinuses of the spine; and the partial palsy of the extremities, especially the lower, generally passing on to complete palsy, arises often from congestion of these sinuses, followed by effusion, or other organic changes. These are facts which I have had occasion to verify in several instances by inspection after death. When the change implicating the cord, its membranes, or origins of the nerves, is such as irritate, excite or similarly affect these parts, pain is usually manifested in the extremities of the corresponding nerves, and sometimes also by other nerves more or less intimately connected with them; but when the primary change goes on to the production of pressure, or to the destruction of parts, then loss of function, impaired sensibility, or difficult or impaired motion, or a combination of these, supervenes, and increases with the augmenting organic change.

136. Not only may irritation or pressure at or near the origins or roots of the nerves of sense and of motion affect the senses, the sensibility, and the motions, even to the remotest parts, but irritation, originating in or affecting the ganglial nerves, will produce serious disorder not only in the seat of irritation, but also in most distant places, which places often evince the chief disturbance, either in respect of their sensibility or their movements, or both. These occurrences are not infrequently verified by post-mortem examinations, the existing lesion being sometimes found in parts which evinced but little or no disorder during life, the severity of the sympathetic affection having attracted the entire attention of both patient and physician. The irritation produced by a calculus in the kidney, by sabulous matter in the tubuli of the organ, often produces disturbance of the organs supplied with nerves from the ganglion and organic nervous plexuses of the organ, extending even to the associated ganglia, and affects not only the urinary functions generally, but also the digestive, occasioning nausea, vomiting, constipation, colicky pains, &c.; and the extent of disorder is sometimes even not so limited, but still further extended. By means of the branches or fibrils of ganglial nerves proceeding from the renal ganglion to the roots of the spinal nerves, and even to the cord itself, as well as by means of spinal nerves proceeding to the sympathetic nerves and ganglia, a sympathetic affection — one consisting chiefly of pain, or morbid sensibility of a painful kind — is sometimes also experienced in various parts of the external surface, or in the course of a nerve, as it ascends to the shoulder or arm of that side, or more frequently down the lower extremity; occasionally with a peculiar numbness or imperfection of the voluntary movements. I have had opportunities of observing such cases, in some of which the pain was as severe as in neuralgia, where also the cause was suspected during life, and no appropriate treatment had previously been adopted. In two instances of recent occurrence, an examination was made after death, and large calculi were found in the kidney. Irritations of the ovaria or uterus, as will be noticed hereafter, develope even a still wider range of sympathies.

137. VI. SYMPATHETIC DISORDERS OF ANIMAL MOTION.—These are of great importance, and present the same relations as have now been pointed out; but I can only imperfectly advert to them at this place. Many disorders, even several that are seated in the abdominal cavity, may affect the locomotive functions; of this we observe daily proofs. Fæcal accumulations, or morbid matters, or worms, in the intestinal canal, often irritate the ganglial nerves, and the irritation is propagated to the roots of the spinal nerves, or even to the spinal cord itself, and is thence reflected by these nerves to the voluntary muscles, to the extremities, or to the external surface. In this way, chorea, infantile convulsions, and various symptomatic disorders, often of an anomalous character, implicating the muscles of voluntary motion, alterations of sensibility on the surface and in the extremities, various affections of the organs of sense, and many of the phenomena observed in cases of intestinal and gastric disease, are frequently developed. (See Arts. CHOREA, CONVULSIONS, EPILEPSY, &c.)

138. There are numerous sympathies or associated morbid states indicated in the *synopsis* or *classification* (§ 14.) of the topics comprised in the very extensive subject here attempted to be discussed, but I must content myself with the mere indication of them thus afforded. The pathologist will readily recognise the importance of most of them, and the medical practitioner will readily furnish illustrations of them from his own experience. One of the chief objects I have in view is, to point out the principal channels of sympathy, or the media by which disorders become associated or complicated; the channels or media having been

recognised, the resulting phenomena, as actually occurring in practice, may more readily be referred to their sources, although they are too various and numerous to be adduced and illustrated in the space to which I am limited. Passing over, therefore, some of the subordinate orders of sympathies which may be ranked under the preceding classes, I shall conclude with a brief consideration of a class of sympathies to which sufficient importance has not always been attached, and which, indeed, has not always been rightly interpreted or understood.

139. VII. The Sympathies evolved by the Reproductive Organs appear about the period of approaching or fully-developed puberty. The influence of the sexual organs upon the economy is evinced at this period by the more rapid growth of the whole body, and by the more complete development of all the structures and organs, and of all the manifestations of mind: and this evolution of the physical and mental constitution of the individual is the more perfect and complete when, circumstances being favourable in all other respects, these organs have not been prematurely excited, exhausted, or abused; for accurate observation will confirm the position, that abuse, or premature excitement of these organs, or excess of such excitement, diminishes or weakens the growth of the body, or impairs the energy of both the organic and the cerebro-spinal nervous systems; and, with other injurious effects, often carried to an alarming extent, impairs or even altogether destroys the chief manifestations of mind, and developes several constitutional maladies and numerous special diseases, with their still more numerous sympathetic associations. The evil is not limited to the delinquent alone, but extends to the offspring of him or her who has indulged in the vices to which reference is now especially directed —if, indeed, such creatures be capable of reproducing their species. If this power be still retained, it is generally manifested weakly, imperfectly and insufficiently, as regards the constitution, physical and moral, of the offspring.

140. Whilst the perfection of mental and bodily function, as well as of corporeal development, thus results from the full evolution of the sexual organs, or from the reciprocal influence exerted between them and the nervous systems, numerous disorders, evincing more or less extensive sympathies and associations, are produced by the causes now alluded to — by abuses of these organs. The exhaustion thereby caused affects not one organ merely, but the whole frame. This generally extended sympathy — this universally diffused state of disorder — is to be explained partly by the exhaustion consequent upon inordinate excitement, and partly by the excessive secretion and excretion of a recrementitious fluid — of a secretion intended not merely for the perpetuation of the species, but also for the support and development of the structures, and of the nervous power of the individual. This functional abuse extends its consequences thus generally, through the medium of both the organic and the cerebro-spinal nervous systems, impairing digestion, vital action and tone, sensation, perception, memory, volition, muscular motion, &c., and hence all these functions not merely languish, but also betray, in varying forms and associations, numerous sympathetic disorders, increased susceptibility of impressions, morbidly increased irritability, &c., whilst nervous power, and endurance, and vital resistance are diminished. Impaired assimilation and nutrition, and a general cachexia, are also among the usual results, even when no particular or specific form of disease is developed. Ultimately the organs, thus prematurely or inordinately excited, either have their functions entirely exhausted or assume an increased susceptibility of irritation, and become the seats either of very frequent or constant disorder, or of organic lesions, whence numerous sympathies irradiate. The morbid state of one of these organs partially extends to all: that of the ovaria affects the uterus and the mammæ, or that of the latter extends to the former. Irritation of either of these organs extends through the medium of the ganglial nervous system to the urinary organs, to the digestive canal, and to the secreting and excreting organs generally. Thus we perceive disorders supervene of the secretion or excretion of urine, flatulence, borborygmi, the globus hystericus, with other affections of the bowels and stomach, and even interruptions of the cutaneous, biliary, and intestinal secretions and excretions.

141. These disorders are almost universally experienced in these circumstances, and as the irritation of the sexual organs increases either in duration or intensity, or as the causes which occasion the irritation are persisted in, the sympathetic disturbances advance still further and more generally by means of the nervous communications already described; and ultimately, in consequence of superinduced alterations of the vascular system and circulating fluids, they are manifested in numerous modes in distant parts of the economy. The individual who has thus devoted himself or herself — it may be said to the infernal gods — soon afterwards, and owing to the sympathy manifested by the ganglial system, complains of palpitations or irregularities of the heart's action, of shortness of breathing, and other signs of pulmonary or cardiac disease, of indigestion or morbid states of the appetite, and of various anomalous pains or alterations of sensibility in different parts of the body. Owing to the connexions subsisting between the organic nervous system, the spinal nerves and cord, and the brain and nerves of sense, and owing to the association of the ganglial and spinal nerves in the organization of the reproductive organs, disorder in various forms is extended to, or is manifested by, the organs of sense, and the muscular and tendinous structures. Volition is often languidly or imperfectly transmitted by the voluntary nerves; the muscles become more and more unable to execute the weak or inadequate volitions; the fibrous and tendinous structures evince impaired vital tone, whilst sensibility and irritability present various aberrations. In conjunction often with these, or more or less independently of some of them, various congestions in different places, either in succession or coetaneously, or irregular distributions or determinations of blood, take place, and either heighten preceding ailments or develope novel forms or combinations of disorder. Congestions of the venous sinuses of the spinal column frequently occur, and disorder the urinary functions or affect the sensibility or movements of the extremities, producing partial, or even complete palsy, either of sensation or of motion, most frequently of the latter. The irritation existing in the primary seat

of disorder is often propagated to the roots of the spinal nerves or to the cord itself, and is thence reflected upon the surface of the body, or in the extremities, in the form of neuralgia, or in other states of altered sensibility, or in various forms of hysterical spasm, convulsion, or disorders of motion. The senses, especially sight, hearing, and touch, are variously obscured or modified, and the mind becomes more or less disordered. The individual whose organic and mental energies have become weakened by the causes alluded to, is envious of those who possess powers which he either never had or has lost; is censorious; indulges in scandal or in the depreciation of others; is mean, spiteful, or sanctimonious; or he becomes the subject of some variety of partial or even of general insanity, or of idiotcy and general palsy.

142. The most dangerous and advanced maladies resulting from the morbid condition referred to — the most serious and complicated mischief thus produced — varies with the constitution, predisposition, and concurring causes and circumstances affecting the individual. In many, asthmatic or pulmonary affections, tubercular consumption, and tubercular formations in different organs; in others, various forms of insanity; in some, organic disease of the heart; and in some, structural change in the brain or its membranes, occasioning epilepsy, palsy, &c., are the more remote consequences. Indeed, almost every form of special disease, with their numerous sympathetic associations, may be simulated, and actually produced, especially when aided by concurring causes, when irritation of the reproductive organs is either frequently repeated or inordinately perpetrated. At first numerous functional disorders are developed, which are continually changing their aspects and their associations, and varying in severity and character. Subsequently, and as these are neglected, or as the cause is continued, or as the original morbid condition increases, disorders which were formerly functional become ultimately organic or structural, chiefly in consequence of the influence which disordered states of organic or cerebro-spinal nervous influence exert upon the vascular actions, upon the assimilating and nutrient functions, and upon the several secreting and excreting organs.

143. Having thus attempted to direct attention to the sympathetic relations of disease, and to the channels through which diseases become associated or complicated, — my limits, however, obliging me to leave many topics connected with the subject altogether untouched, — I wish to impress upon the reader the advantages to be derived in practice, from tracing, as accurately as possible, the bonds of connection which associate or complicate the more specific and primary states of disease, and render morbid phenomena often difficult of interpretation, and as often difficult of removal. Having ascertained as accurately as possible the primary source of disorder; having traced the succession as well as relations of morbid manifestations, and the connection of the whole with antecedent and existing causes; having, moreover considered the probable extent of nervous disorder and of vascular disease, and of alteration or contamination of the circulating fluids, a rational basis is thereby formed for therapeutical indications and remedial measures; and, as respects both the general intentions and the particular means, these will be the more appropriately and successfully adopted.

144. I believe that the physician who thus enters on the study of each case which comes before him, and endeavours to connect the effects presented to his view with their causes, and to trace the bonds of union subsisting between those frequently distant effects, will generally exercise his profession successfully and honourably; for being acquainted, as he should undoubtedly be, with the nature and operation of the remedies he employs, he will apply them appropriately to the removal of those morbid conditions which he rationally infers to be present. A physician whose mind is thus tutored and practically engaged will be neither sceptical of the effects of medicine on the one hand, nor empirical and rash in the use of it on the other. This extensive and practical knowledge, being always appropriately applied, will prevent him from lapsing into a scepticism which, entertained by any member of our profession, is not degrading to the profession itself — for truth and honour cannot be degraded — but which is most degrading to the sceptic himself, inasmuch as he admits himself to be deluding the public, whilst he boasts that he is not himself deluded, and thus vaunts his own dishonesty. Neither will the enlightened and rational physician lapse into a state of blind empiricism, and wield the weapons employed against disease in such a manner as will not only endanger the life of the patient, but also injure his own reputation.

145. I have been anxious to entertain the subject now imperfectly discussed, because it has hitherto failed of obtaining an attention in any way commensurate with its importance. My limits have obliged me to omit several topics more or less intimately connected with it. The observations, therefore, which I have offered, will, I hope, be viewed as *suggestive* only, especially in respect of various subordinate topics, for as my space did not allow me to illustrate, I could suggest merely.

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SYMPTOMATOLOGY, *comprising* DIAGNOSIS *and* PROGNOSIS.

— SYNON. — *Symptomatology*, *Symptomatologia* (from *συμπτωμα*, a symptom, and λόγος, a treatise); — *Semeiology* (from *σημεῖον*, a sign); — *Semeiologia*, — *Semeitice*; — *Symptomatologie*, *Semeiologie*, *Semeiotique*, Fr.: — *die Zeichenlehre*, *die Symptomatologie*, Germ.

DIAGNOSIS. — SYNON. — Διαγνωσις (from *διαγνωσκω*, I distinguish); — *Diagnosticks*; — *Diagnostic*; — *Diagnose*, Fr.; — *Kennzeichen*, *Erkennung der Krankheit*, Germ.; — *Diagnostica*, Ital. —

PROGNOSIS. — SYNON. — *Prognosis* (from *προ*, before, and *γινωσκω*, I know); — *προγνωστικον*, Hippocrates; — *Præcognitio*, *Prænotio*, *Præscientia*, *Prædictio*, Auct.; — *Prognostic*, Fr. — *Die Vorhersagung*, *die Prognose*, Germ.

CLASSIF.: — GENERAL PATHOLOGY.

1. In the article DISEASE, I gave an ample sketch of the *Causation of Disease*, or *Ætiology*, not only mentioning the several occasions of disorder, but also arranging them and showing their modes of operation. I afterwards considered the *general doctrine of disease*, or PATHOGENY, and described the changes constituting disease, as they proceeded more immediately from the causes producing them; noticing in succession the simpler or dynamic changes, the more complicated or qualitative alterations, and the effects of these changes upon the secretions and excretions, upon the circulating fluids, and upon the nutrition of the several structures. After a sufficient consideration of the numerous topics comprised under these heads, I noticed the *Procession and duration of morbid phenomena*, the *Types or forms of disease*; the *Terminations of disease*; the *Relations, successions and complications of disease*; the *Metastases or conversions of disease*; and, lastly, the *circumstances modifying the Form, complication, duration and terminations of disease*. I thus developed, under the article Disease, a *system of pathology*, which, in certain of its parts, is more fully illustrated in the several articles on special topics — on the *blood*, on the *structural lesions* of the several tissues and organs of the body, &c.; and which, when connected with others, and with the article now commenced, will furnish the reader with comprehensive views of morbid actions, will demonstrate the relations and connections of these actions, and will enable him to arrive at rational conclusions as to their natures, and as to the indications and the means most appropriate for their removal, for their alleviation, or for their control. Having discussed the numerous topics referred to, I have now to notice the *symptoms and signs*, by which the *forms and states of morbid action* are recognized and duly estimated, especially as respects the *seats*, the *natures* and the *results* of such actions.

2. A knowledge of disease comprises not only a recognition of existing symptoms and signs, but also a due estimation of the value, importance, and source of each, the comparison of one with the others, the relations subsisting between them, the connections between them and their antecedents and causes, and the results which may be expected from them, and their various combinations and groupings. In estimating the importance of symptoms, as showing the seats, the limitations, and issues of morbid action, they require due consideration both in the aggregate and individually, and not merely as regards the associations they present, but also as respects the absence of others, which are indicative of the seat, nature, extension or issue of other special diseases, or of distinct but allied or similar states of morbid action; — absent manifestations of disease should be taken into account in our estimation of the value or importance of those which are present.

3. *The Manifestations of disease*—the symptoms and signs by which the seats and natures of diseases are indicated — are, 1st., vital or spontaneous, or strictly sympathetic and symptomatic; or 2d., physical or artificial. The former of these only are comprised in this article, the latter have been fully discussed in the articles ABDOMEN, AUSCULTATION, CHEST, SUCCUSSION, &c. In treating of *the Sympathetic and Symptomatic Manifestations of disease*, or of *Symptoms* more especially, I shall *first* notice those which appertain to the *appearance* and *attitude of the body*, and to the *Animal*, *Loco-motive*, *and Sensory functions*; *secondly*, those which belong to the *Respiratory and Circulating Organs*; *thirdly*, those which are manifested by the *Digestive and Assimilating Organs*; and, *lastly*, those which concern the *Urinary and Sexual functions and organs*.

4. I. Symptoms and Signs appertaining to the Attitude and Appearance of the Body, and of the Animal Functions.—Numerous changes in the attitude and appearance of a patient at once strike the experienced observer, and suggest a general and often a correct idea of the nature of the disease which he is called upon to treat.—i. The Attitude and general Appearance of the Body furnish signs both of the nature and of the tendency of the disease. A constantly retained position on the back indicates depression of vital power, and, in febrile diseases, extreme exhaustion or asthenia. It is most remarkable in low, typhoid, adynamic or pestilential fevers, and in the last stage of acute maladies, especially when, with extreme exhaustion of organic nervous power, there is either low or muttering delirium, or unconsciousness, or coma, or more or less contamination of the circulating fluids. When this position is long retained, especially without due attention to cleanliness or dryness of the surface, the more prominent parts or those most pressed upon, become inflamed, ulcerated or gangrenous; and the results are often fatal, unless the local and constitutional treatment be active and appropriate. If this position be attended by a sinking or falling down in bed, owing to a tendency of the body to gravitate to the lower or more depending parts of the bed, and to lost power of the extensor muscles, the positions of flexible parts being somewhat bent, and the head gravitating in the direction where the support is the least, the exhaustion of vital power and the consequent danger are the greatest, especially in the maladies just named. When the patient becomes capable of recovering his position when he feels himself falling down in his bed, or falling from his pillow, and especially when he is able to turn to either side, and to retain for a time a position on his side, or even partially on his side, it is one of the earliest indications of returning powers in low or adynamic febrile maladies. The supine position, with the knees drawn up, so as partially to relax the abdominal muscles, and to keep off the pressure of the bed-clothes, indicates morbid sensibility or inflammation, or both, of one or more viscera in the abdominal cavity, and more especially peritonitis, enteritis, gastritis, &c. In these cases, the supine position is retained, not so much in consequence of exhaustion, as in order to remove the pressure of the contiguous viscera from the diseased parts.

5. The sitting attitude, the inability to lie down in bed, the necessity of being shored up in bed, and various sitting positions, are important indications of the diseases to which the physician's investigations should be particularly directed. The sitting position can hardly be relinquished in dyspnœa, asthma, in organic diseases of the heart, in extensive effusion into the pleural cavities, in bronchitis of both lungs, in laryngitis, in many cases of congestive or asthenic pneumonia, and in severe or complicated cases of epidemic influenza. In the worst states of these especially, the patient is unable to repose on either side, without great increase of his sufferings, inasmuch as the weight of the upper regions of the trunk upon the side, on which he rests, greatly impairs the respiratory functions of that side, whilst the action of the side left free is insufficient for the respiratory changes, and for the purposes of the economy.—In less severe or urgent cases, the patient retains a semi-supine position, by having the shoulders and head elevated by pillows. In the more extreme cases of these maladies, the patient is obliged to lean forwards, and often to place his elbows or arms on the table in order to procure a fixed point for a stronger contraction of the muscles of respiration. In protracted cases of this kind, the shoulders acquire an unnatural elevation, and are directed upwards and to the ears.

6. A restless mode of lying down accompanies severe states of thoracic inflammation and acute rheumatism, and several organic maladies. A quiet position on lying down, with perfect consciousness and returning strength, indicates a favourable termination. This position, however, is retained in rheumatism in order to avoid the pain occasioned by moving. Lying on the abdomen, and tossing from the prone to the supine position, or from side to side, attend violent colicky pains, and ileus, or the passage of gall-stones, and hysteria. Patients often prefer to lie on the right side in health, and generally in pneumonia, in bronchitis, and in cases of pleuritic effusion, of this side, after pain, or the more acute symptoms have subsided; also in splenitis and psoitis of the left side. They generally lie on the left side, in pneumonia, bronchitis, and when effusion has taken place into the pleura of this side, and the pain has ceased. At the commencement of pleurisy, patients lie either on the back or in the semi-recumbent position, or on the side opposite to that affected, whilst the pain continues, and before effusion has become great; they also frequently prefer to lie on the back, or in a raised position, in organic affections of the heart and large vessels.

7. ii. The Expression of the Face and state of the Features.—The facial expression is of great importance in recognition, diagnosis and prognosis of disease; and sometimes, especially in *children*, it is the chief means of evincing the nature of the malady. In them the appearances of the countenance may be observed with advantage whilst they are asleep, as well as when they are awake; and, in many cases, it is of use to observe the expression immediately upon awakening them. Although the experienced observer will be guided in his diagnosis by the expression of the face of children, yet he will generally find great difficulty in describing the appearances which thus influence his opinion.—*a.* The knitting of the *brows*, or frowning, in children usually indicates inflammatory irritation of the brain or membranes, or of both. And with this expression are often conjoined a contraction or approximation of the eyebrows and zygomatic arch. Relaxation of these parts, with a relaxation, drooping, or falling of the eye-lids, is a sign of vital exhaustion, or of effusion or pressure on the brain.

8. *b.* A *dark circle* surrounding the eyes, and most remarkable beneath the eyes, often with more or less sinking of these organs into their orbits, is often observed in connection with organic diseases, especially those of a malignant or contaminating nature. It is also very manifest in females who are subject to uterine or ovarian diseases, or to severe or prolonged leucorrhœa, or who addict themselves to masturbation. A *puffy or œdematous* appearance of the eye-lids, or below

the eyes, is observed in diseases of the heart, especially those implicating the valves, and in granular lesions of the kidneys, as well as in connection with several forms or seats of dropsy. Sudden or rapid *sinking of the eyes* inwards, with increase of the dark circle surrounding the eyes, is a most remarkable and most unfavourable sign in the stage of collapse of pestilential cholera, in an advanced stage of adynamic, hectic and malignant fevers, and in the last or most unfavourable periods of gastritis, enteritis, dysentery, and of purulent, tubercular, or cancerous contamination of the circulating fluids.

9. *c.* The *nose*, especially in connection with the *cheeks*—the *nasal* and *genal* expression—furnishes much information as to the seat and issue of disease, especially in children. A pinched appearance of the nose, with a retraction or dimpled state of the cheeks, often is observed in an advanced, or in an unfavourable, course of diseases of the digestive organs; and a remarkable dilatation and contraction of alæ nasi—a working of the nostrils, with or without retraction of the angles of the mouth,—attend not only the most dangerous forms or stages of disease of the respiratory organs; but most of those maladies in which the organs of respiration become more or less implicated at an advanced period, or towards a fatal termination. In severe or dangerous inflammation of the diaphragm, or of the serous membranes reflected over this part, those signs are most prominently manifested. The alæ nasi and cheeks are drawn upwards and outwards in the most painful and spasmodic affections of the digestive canal and diaphragm, especially in spasmodic gastralgia and enteralgia, in colic, ileus, and during the passage of biliary calculi.

10. *d.* The *lips* and *mouth*, with the chin, furnish important indications, — the *Labial signs.* — Retraction of the corners of the mouth, so as to produce the sardonic grin, is very remarkable when the diaphragm is inflamed or implicated in the manner just now stated, and in very painful and dangerous affections of the stomach, bowels, and tendinous aponeurosis. The lips are thin, retracted, or apparently stretched over the teeth and gums, in the last stage of hectic, especially when caused by pulmonary disease; the actions of the nostrils being also remarkable and unnatural. The face in these cases, particularly when emaciation has made great progress, is pinched in, retracted, and diminished, the chin becoming sharper and more prominent. The lips often are surrounded by a dark circle in chronic affections of the stomach, bowels, or liver. The lips lose their ruddy hue, or become more or less *pallid*, in anæmia, however produced, after hæmorrhages, in chlorosis, in diseases of the spleen, and in uterine and ovarian maladies. They often, at the same time, present a less erectile or tumid appearance, and are more disposed to crack, or become irritated or sore. Soreness of the lips and eruptions on them externally, are frequently observed in the course of chronic affections of the digestive canal, and abdominal viscera, especially in children at a far advanced stage of those diseases. The lips are often similarly implicated, but in a slighter degree and in a more fugitive manner, in connection with catarrhal affections. They often *swell*, especially the upper lip, in connection with latent or developed scrofula and tuberculosis; and in cases of intestinal worms. A *dark*, or a *purple hue*, of the lips, is generally present, when the blood is imperfectly changed to the arterial state, owing to disease of the lungs or heart, or of the respiratory passages, especially congestive bronchitis and broncho-pneumonia, or to effusions of fluid into the thoracic cavities. When this change of colour is observed in those maladies, it ought always to be viewed as a most dangerous appearance.

11. *e.* The *general expression* of the countenance may be bashful, down-cast, painful, anxious, terrified, enraged or joyful. — A bashful, down-cast appearance, or an inability to look the person addressed fully in the face, is a certain indication of nervous exhaustion by masturbation and of impotency. This down-look in patients complaining of chronic disorders, or of diseases of debility, at once indicate the cause in which they have originated. — The expressions of pain and anxiety are readily recognised in connection with pain, extreme soreness, difficult respiration, palpitations of the heart, injuries, and inflammations of vital organs or parts. The expression of terror or extreme fear is observed chiefly after severe or dangerous accidents or operations, during excessive hæmorrhages, in rabies, in delirium tremens and insanity. The expression of rage occurs chiefly in mania, rabies, phrenitic delirium, and monomania. The countenance is vacant or unconcerned in true hæmagastric pestilence when it becomes also of a pale lemon colour, in amentia or idiotcy, and in general paralysis. It is tumid or bloated, all the features often appearing enlarged and exaggerated, in congestive and sanguineous apoplexy, in obstructive circulation from disease of the heart or valves, and in connection with dropsical effusions from such disease, and from diseased kidneys.

12. *f.* The *tint, hue,* or *colour* of the countenance furnishes important signs of disease. A pallid or anæmied hue of the countenance attends deficiency, thinness or poverty of blood, especially when observed in connection with pallor of the lips, gums and tongue; this state of the circulating fluid being either a primary ailment, or variously associated, or consecutive of numerous maladies—being thus either a *primary*, an *associated* or a *consecutive anæmia*.— *Primary* owing to inanition, to want of sunshine, light and pure air; — *Associated* with torpor, inactivity or exhaustion of the sexual organs, and characterized by a pale greenish yellow tint of the face, as in chlorosis; with disease of the uterus or ovaria; with tuberculosis of the mesenteric or bronchial glands, with disease of the spleen, or with wasting or structural lesions of the testes; — *Consecutive* of all fevers, of acute rheumatism, of inflammatory and structural diseases of the digestive organs, and of the absorbent system; and of tubercular and cancerous maladies.

13. A *dark, lurid,* or *murky tint* of the countenance is commonly attended by a similar hue of the general surface, especially in low, adynamic, typhoid or malignant forms of fever. It indicates a morbid condition of the circulating fluids, the blood being more or less contaminated and insufficiently changed from the venous to the arterial state. Along with this hue other tints may be associated, as that of *lemon tint*, as in

the hæmagastric pestilence, the features still retaining their fulness or plumpness; or a deeper *yellow* or jaundiced hue, as in severe bilious remittents, the features being more or less sunk; or a *greenish yellow*, or dark *green hue*, when the liver and biliary passages are completely obstructed, or the former disorganized throughout. A continued *sallowness*, or *murky pallor* of the countenance, is commonly an attendant upon torpor and chronic affections of the liver, and upon disease of the spleen. The face, the general surface, and especially the extremities and nails of the fingers and toes, assume a *leaden* or *lurid tint* in the stage of collapse of pestilential cholera; and this tint often becomes deeper and darker as the patient sinks, the features being collapsed, and the eyes sunk deep in their sockets. A livid hue of the countenance, most remarkable in the lips, and commonly with lividity of the nails and fingers, occurs in the last stage of pneumonia and general bronchitis, in congestion of the lungs, in obstructive diseases of the heart, and in dropsy of the thoracic cavities; and it is always a most dangerous, and generally a fatal sign.

14. A *pink hue* of the cheek, or a *pinkish red*, sometimes limited to the more prominent part of the cheek, is usually seen in hectic, especially the hectic of pulmonary disease. A generally diffused redness of the face attends inflammatory fevers, and is often observed during inflammation of the lungs, and occasionally in phrenitis. A persistent redness of the face sometimes occurs in persons advanced in life, who are accustomed to live fully or to drink port wine too freely, the features being usually at the same time large or developed. Redness of the face, with unusual fulness of the features, is often present in sanguineous apoplexy. The redness of the features which accompanies eruptive fevers is readily distinguished by the history and circumstances of the case, by the pulse and by the state of the general surface. A circumscribed patch of redness on one, or on both cheeks, is sometimes observed in chronic visceral diseases, and in low or hectic fever attended by alteration of the blood.

15. *g.* The *size* of the features generally—of the whole face—is often very considerably altered in disease. It is apparently *augmented* in sanguineous or congestive apoplexy, in acute mania, in phrenitis, and in convulsive diseases, especially epilepsy, in obstructive diseases of the heart, particularly those accompanied with dropsy, in acute and congestive pneumonia, and in the acute states of vascular action, observed in the hot stages of fevers,—periodic, continued, or exanthematous. — The size of the face is *diminished*; the features being shrunk or pinched, in the cold stage of periodic fevers, in pestilential cholera, in the advanced states of visceral disease attended by emaciation, especially of phthisis, and of hectic fevers. When the shrinking of the features becomes very remarkable in the advanced stages of either acute or chronic maladies, or approaches to what has been termed the *facies Hippocratica*, it is always a most unfavourable, and commonly a fatal sign.

16. iii. STATE OF THE GENERAL SURFACE OF THE BODY. — *A.* The *colour* or *hue* of the surface frequently partakes of that of the countenance. Where the latter is ruddy, healthy and animated, the former is neither altogether pallid or white; nor dusky, lurid or dark, unless in the darker races. In the European, particularly of northern latitudes, the hue of the surface is that of white animated by a slight tint of carnation or pink. In the anæmied and chlorotic, and often in the leuco phlegmatic and anasarcous it is pallid, or a dead-white, sometimes slightly tinted by yellow or pale yellowish green. The colour of the skin is more than naturally sallow, pallid or murky, in functional and organic diseases of the liver, spleen, often in chronic diarrhœa and dysentery, in obstructions of the mesenteric glands, and sometimes in organic diseases of the uterine organs. In the several forms of jaundice noticed above (§. 13.), the hue of the general surface is yellow, of various grades to a yellowish green, or even to a murky or deep green. A pale yellow, or lemon tint, with greenish or livid streaks or patches as the malady advances, characterizes hæmagastric pestilence; whilst a jaundiced yellow often attends remittent fevers, the tint becoming more deep or lurid, as the disease assumes more and more of a putro-adynamic character. The hue of the surface is dark, dirty or lurid in continued fevers of an asthenic or adynamic type; and it becomes darker or more foul as the disease advances, and as the powers of life sink. In the cold or formative stage of fevers, the hue is pallid, and the surface rugose, presenting the *goose-skin* appearance. As reaction supervenes, this disappears, and passes, with the increase of reaction, into the warm and carnation glow of health. When, however, no such healthy reaction occurs, as in adynamic, typhoid, putro-adynamic and pestilential fevers, the pallid hue of the general surface passes into a lurid, harsh or foul appearance; and this, either becomes deeper and more remarkable, or, as in the choleric pestilence, assumes a peculiar leaden or livid aspect, as the malady approaches a fatal issue.

17. *Deeper or other discolourations* of the skin are either partial — in spots or patches; or more marked in some situations than in others. These consist either of very limited exudations of the colouring particles of the blood under the cuticle, in one or other of the tissues composing the skin, or of exanthematous or other eruptions. The former constitute the characteristic of purpura, of scurvy, and of some forms of fever. When the vital cohesion or tone of the capillaries is relaxed in certain tissues, as in the vascular rete of the skin; and when, at the same time, the healthy crasis of the blood is much impaired, as in those maladies, minute exudations, containing more or less of the colouring matter of the blood, take place, in the form either of punctæ or of larger spots or even patches; and, according to the states of vital power, and of the exuded fluid, present various hues, from a bright or scarlet red, to a livid or blackish colour — *petechiæ*, *vibices*, *&c.* (*See Art.* FEVER, §§ 470, 471.). These seldom undergo further changes unless in the extremities, where, from neglect or improper treatment, the exudations may be followed by ulceration, especially in scurvy, and by sphacelation, as in the putro-adynamic states of fever.

18. *B. The Eruptions* on the surface of the body furnish most important indications as respects not merely the nature of the disease, but also its pro-

gress and issue. Exanthematous, acute and chronic, eruptions have been very fully discussed in the several articles on the diseases which are characterised by them. It is hence unnecessary to take further notice of them, than to remark, in general terms, that the less general or copious the eruption, and the less the functions of the skin are impaired by it, the more may the result be considered favourable; and that the more diffused, general and confluent the eruption, and the deeper the colour, the more unfavourable should be the opinion as to the issue. As respects all eruptions, but more particularly as regards the exanthematous, deepness of hue, — lividity or darkness of colour, — should be viewed as being much more dangerous than the amount or extent of eruption; for, even when extensive, the risk may not be materially increased as long as the hue is that of a lively red; but in proportion to the deepness of the tint, and as it approaches to lividity or blackness, the danger becomes extreme.

19. *C. The temperature of the surface* varies remarkably with the grades of vital power and of vascular action; and the character of the temperature is much modified by the state of the perspiratory function. — (*a.*) A general *depression* of temperature often attends sinking of vital power; and when this sinking becomes extreme it is commonly accompanied with cold perspirations, which are most remarkable in the extremities, as in the last or fatal period of most diseases, and over the whole surface in the choleric pestilence; the depression of temperature being also great, especially in this malady, and manifestly increased by the evaporation of the perspired fluid. — Coldness of the surface ushers in many febrile and inflammatory diseases — especially the cold stage of periodic fevers, and of visceral inflammations; but the coldness in these maladies exists more in the mind of the patient, than to the perception of the physician; and it is generally attended by peculiar phenomena and sensations — by chilliness, horripilation, shivering, rigors or horrors, which may be viewed as grades of the same sensation, and which are accompanied with a remarkable feeling of cold extending from the occiput along the spine, and with constriction and dryness of the integuments. In these cases, the sensation of coldness, when thus characterised — by horripilation or shivering — is altogether morbid, the temperature of the general surface either not being depressed, unless in the extremities, or being sometimes even much increased, especially over the trunk The sensation of coldness and the shivering, both in these maladies, and in cases of internal abscess, or where matter is being formed, are to be imputed chiefly to the concentration of the morbid action internally, or to the determination of the circulating fluids to internal or vital organs, and but partially to the diminished temperature of the extremities and surface, and to the constriction of the integuments; for, even when the sensation of coldness or chilliness is very considerable, and the horripilations amounting even to shivering, the heat of skin, especially over the trunk, may be excessive; but in these cases the surface is not only hot, but also dry and constricted; and either reaction is being about to be developed, or a copious perspiration is about to supervene, as when these symptoms indicate the formation of an internal abscess. When they occur in very aged persons, and depend neither upon the invasion of a febrile paroxysm, nor upon any visceral irritation or *inflammation;* and even when, in those persons, they recur at intervals, and alternate with sensations of heat or flushing, they are dangerous symptoms, generally issuing in dissolution.

20. (*b.*) The coldness of the surface, whether actual, or existing chiefly in the sensations of the patient, whether marking the invasion of a febrile paroxysm, or the commencement of inflammatory action, or the formation of abscess in an inflamed organ or part, should be viewed chiefly as a change in the state of organic nervous power or influence upon the vascular system; this influence being more or less depressed or impaired in the extremities and periphery of the frame, and either determined to, or increased in vital or internal organs, the vascular system being similarly affected, owing to the organic nervous influence on it. If this influence be so powerfully impressed as to be incapable of restoration, or so overwhelmed by the cause impressing it as to sink progressively, coldness of the surface becomes more general, more manifest and actual, and death ultimately takes place; but, when the organic nervous or vital influence is morbidly impressed, without being overwhelmed or destroyed altogether, the concentration of that influence in vital organs, or the remains of it in these, enable them to react upon the blood which is superabundantly returned or determined to them, and thus the circulation is kept up, and secretion and excretion are promoted, until the morbid impression and its various consequences are removed. One of the earliest of these consequences is depression of the animal temperature, with constriction of the integuments, which is followed by reaction when the vital influence is not altogether overpowered. According to the nature of the morbid impression, or of the irritating cause, the temperature of the surface, and the sensations and other pheonomena characterising the state of the cutaneous surface, vary remarkably: and, whilst the temperature may be absolutely lowered, with or without a sense of chillness or coldness, or horripilations, in some cases, with shivering or rigors in others, and even with horrors and distressing tremors; it may not be materially depressed, unless in the extremities, these attendant pheonomena occurring nevertheless. The rigors, and the still more severe manifestations of tremors or horrors, are indications of the severity of the morbid impression, or of the cause of irritation on the nervous system, and more especially upon the spinal chord and nerves proceeding from it. We often observe irritation of mucous or serous surfaces, by various causes, as by the passage of a calculus along a duct, and even by the introduction of a catheter or bougie along the urethra followed by constriction and coldness of the surface, by horripilations or rigors. In these cases the cause of irritation, acting upon a single part of the circle of organic nervous endowment and influence, disturbs the healthy distribution of the blood, depresses or diminishes the circulation in the periphery of the frame, concentrates it towards internal parts, whilst the irritation existing in a part of the organic nervous system is propagated by communicating nerves to the spinal chord, or to

the roots of the spinal nerves, and is reflected thence by the spinal nerves to the muscles of voluntary motion, occasioning rigors, tremors and horrors, which cannot be controlled by volition, until the more general diffusion of the primary morbid impression or irritation, and the reaction and the consequent equalisation of the circulation remove the morbid effects extended to the spinal nerves and the muscles supplied by these nerves. (See §§ 22. *et seq.*)

21. Coldness of the surface of the body is attended by various modifications, as respects both the sensations of the patient and the perception of the physician, according to the cause which produces it, and to the function or state of the skin at the time. When the coldness proceeds from depression or irritation of organic nervous influence, in connection with manifest disturbance of the circulation, then the surface is generally also dry and constricted, as in the invasion of diseases proceeding from causes which primarily simply depress or irritate; but when, with this change in the nervous system of organic life, there is also loss of vital tone or cohesion — when, owing to the excessive irritation or depression, or to the loss of vital cohesion, or to poisonous contamination, there are also relaxation of the integuments, and increased perspiration, then the coldness of the surface is not merely augmented, but it is characterised by a peculiar sense of rawness as well as of coldness — partly augmented by evaporation, and partly by impaired circulation. Colliquative perspirations which are not consequent upon heats or flushings, and the state of the surface in the last stages of low fevers, in the choleric pestilence, and after poisoning by numerous depressing, contaminating and irritant poisons, furnish various modifications of this condition.

22. (*c.*) *Increased temperature* of the surface is an important sign of disease, whether it occurs primarily, or consecutively of more or less depression; and, according to the character of the increased heat, so may not only the state of vascular action be partly inferred, but also the condition or amount of vital power and resistance. Heat of the skin is rarely so great, when it occurs primarily as when it supervenes upon chills or rigors. In the former case, it is more moderate, generally subsides sooner; and, unless when it is caused by the infection of some animal poison, is more free from other morbid phenomena manifested in the general surface. When heat of skin follows rigors, the reaction of the vascular system, upon which it chiefly depends, influenced however by the organic nervous power, carries the temperature several degrees above the standard of health, and this high range is often increased or prolonged by the constriction and dryness of the skin, and by the morbid state of the blood itself — morbid in consequence of deficient action of the emunctories during the preceding depression, coldness, chills and rigors; the augmented quantity of effete materials in the blood irritating the blood-vessels and vital organs, and morbidly exciting the nervous system of organic life. The result, as respects the surface and integuments, is not merely an increase of temperature, but also, and chiefly, owing to the dryness of the skin, and to the state of the circulation now mentioned, a peculiar sensation imparted to the hand of the observer, and characterised by a harshness, acridity or burning, and sometimes by a feeling of stinging or tingling to the patient himself.

23. When the circulating fluids are not greatly altered or contaminated, and the organic nervous influence not seriously depressed or perverted, the excitement of the vascular system, producing augmented heat of surface, gradually subsides, and with it this particular effect. As the excited vascular action abates so the skin relaxes, secretion and excretion, in the several emunctories, either returning or increasing, and with the return of the functions of the skin, the temperature of the surface falls. A fit of ague furnishes an apt illustration of the states of the surface of the body in different febrile and other morbid conditions of the frame; and of the succession of these states, and of the influence of the antecedent, in producing the consequent condition.

24. A harsh, fiery or burning heat of surface is always an unfavourable sign, especially in visceral inflammation; and if, at the same time, the patient complains of a sense of burning at the præcordia, or of internal heat, with anxiety, jactitation or restlessness, the extremities becoming cool or cold, or being covered by a cold perspiration, a fatal result, especially by gangrene, may be expected. Increased heat of head indicates frequently a disposition to apoplexy in the aged, to inflammation of the brain or its membranes in the young and middle-aged, and to convulsions or meningitis in children. A burning or acrid heat of surface in the hot stage of periodic, and of hectic fevers, augurs a malignant or dangerous form of the one, and a fatal termination of the other, especially when diarrhœa is also present, or when the heat of skin is followed by excessive colliquative perspiration. The temperature of the surface is always highest over a sthenically inflamed organ; and, as respects the extremities, it differs more or less in different sides in hemiplegic or partial paralysis, as shown when treating of that malady.

25. iv. THE PERSPIRATORY FUNCTIONS of the skin are variously affected by disease, and aid more or less in evincing the nature and the result of the malady. Interruption to, or entire suppression of, the perspiration, as shown by dryness of the skin in the earlier stages of fevers, and of inflammations, is of much importance as respects the states of the circulating fluid and of vascular action. This state of the surface may be attended by depression of temperature (§§ 19. *et seq.*), as in the cold stage, or in the invasion of these diseases, or by increased temperature (§§ 22. *et seq.*), as in the hot stage, or when vascular action is excited; but, however associated, or accompanied by each in succession, suppression of the perspiration is indicative of the invasion or commencement of fever or of inflammation, when attended by coldness of surface or by chills or rigors, and of a farther advanced state of these maladies when the skin is not only dry but also hot. The amount of dryness, and of either coldness or heat with which dryness is associated, and the duration of these states of the surface, are matters of much importance in our estimation of the nature and extent of disease, and of the probable issue; for if the suppression of the excreting function of the skin be more or less complete, and of considerable dura-

tion, and no other excreting organ or emunctory supply vicariously the defective function, — if the injurious elements and materials usually eliminated by the skin, are not partially or altogether carried out of the blood by other organs, it must necessarily follow, that the prolonged suppression of the perspiratory function will contaminate or poison the blood; and that the primary or local disease will be thereby exasperated, or a morbid state of general vascular action will be developed, varying with the changes produced on the blood by the other emunctories, and giving rise to further alterations, both functional and organic.

26. *A. A perspirable* and *humid state* of the cutaneous surface, when attended by a soft, natural, slightly unctuous and moderately warm condition of it, is always a very favourable sign, especially when it is general, and not limited to a single region or part; but, when the perspiration is spontaneously excessive, and results not from unusual exertion or from medicine, &c., more or less disorder, sometimes of a very dangerous nature, is then present. The *quality* and *odour* of the perspiration require attention, as well as the quantity; and the circumstances and occasions of excess ought also to be noted. It should not be overlooked, also, that the cutaneous perspiration is not always or altogether suppressed when it is no longer manifest to the senses; for an insensible perspiration generally exists, which may vary with the state of the patient, with the temperature of the skin, and with the dryness, humidity, and electrical states of the air. The perspiration which may be insensible in dry states of the air, may become sensible, or collect on the surface, in the form of sweat, when the air is moist and relaxing. During health the perspiration is more insensible than sensible, and along with the exhalation of fluid from the surface, a secretion takes place from the follicular apparatus of the skin, which softens, and even partially lubricates the cuticle, especially in the negro race, and promotes both the insensible and sensible perspiration by disposing the surface to the transmission of its accustomed exhalation. The sensible and the chemical qualities of the perspiration vary considerably in different regions of the body, owing partly to the greater admixture of the secretion from the follicular or sebaceous apparatus. The difference is most manifest in respect of the perspiration from the axillæ and the groins, &c., the organic or solid constituents being most abundant in the sweat of these regions. But before any notice should be taken of morbid states of the perspiration, the healthy condition of this excretion ought to be mentioned.

27. *B. In health*, the perspiration, when too copious to be carried off in the atmosphere, without becoming sensible, or in the state of insensible vapour, is condensed in the form of fluid, or *sweat*; 1000 parts of which consist of from 993 to 995½ of water (Anselmino, Berzelius, Simon, &c.). The remaining solid constituents consist — 1st. Of substances soluble in water, — watery extract, phosphate of lime, and occasionally an alkaline sulphate. — 2nd. Substances insoluble in water, — desquamated epithelium, and, after the removal of free lactic acid by alcohol, phosphate of lime, with a little peroxide of iron. — 3rd. Substances soluble in ether, — traces of fat, sometimes including butyric acid. — 4th. Substances soluble in alcohol, — alcoholic extract, free lactic acid, and acetic acid, chloride of sodium, lactates and acetates of potash and soda, lactate and hydrochlorate of ammonia. In addition to carbonic acid, nitrogen is exhaled from the surface in constant but varying proportions, according to the nature of the diet and the amount of exercise. The functions of the skin may be divided into — 1st. The *Physical*, — the exhalation of pure water and gas. — 2nd. The *Organic*, — the product of animal excretion, or the secretion of cells. The cutaneous excretion is in antagonism with the pulmonary, with the urinary, and with the intestinal; an excess of either diminishes more or less the amount of it.

28. *C.* The *amount* of the insensible and sensible (sweat) perspiration has been variously estimated in health, but not with that approach to precision which would warrant a positive statement. It it very remarkably increased or diminished *in disease*, the diminution being more difficult of estimation, than the increase. In the cold states of disease, the diminution may be very remarkable, or scarcely to be estimated, and, in some cases, as in those characterised by sinking vitality, the perspiration may be excessive, as observed in pestilential cholera. In hot states of the surface, the temperature may prevent a more than natural transpiration from being condensed into a sensible fluid, the perspiration being excessive and yet being insensible. But whether sensible or insensible — whether diminished or increased, but more remarkably when increased, the perspiration is attended by very different kinds of *odour*, the odour often depending upon the chemical constitution and organic constituents or elements of the excretion, and being generally peculiar to each specific disease, although different observers have described the odours differently, or have assigned to them different resemblances.

29. The *increase of sweat* is very remarkable, not only in different maladies, but also in different periods of the same malady. Thus, while perspiration is diminished or almost suppressed in the cold and hot stages of ague, it is remarkably increased in the sweating stage. The same is observed in the paroxysms of hectic, in remittent fevers, and in continued fevers, but in prolonged stages, and even in inflammations. The most remarkable increase occurs in acute rheumatism, in the advanced stages of pulmonary consumption, in pestilential fevers, and in most maladies characterised by sanguineous contamination or poisoning, or infection of the fluids; and, in these especially, the *quality* and the *odour* of the perspiration are much altered.

30. *D.* The *quality* of the sweat is changed in most febrile diseases; but the change of quality, with reference to each, has not been satisfactorily shown. — *a.* The free *acids* may be much increased, Lactic acid, the ordinary free acid, is usually more abundant than in health, in cases of rheumatism and gout, and probably, also, uric and acetic acids. Dr. Prout detected the last in hectic fever, and both it and lactic acid may be present in the puerperal states of fever and in erysipelas. Anselmino found free acetic acid in women during their confinement, and Stark, an increase of the lactic acid in scrofula, rickets, and in several cutaneous eruptions.

31. *b. Ammonia* does not appear to exist in the

sweat in a free state, but chiefly in the state of lactate or hydrochlorate, although it may be found soon after the fluid is excreted, and during its retention in the armpits and groins. As to the actual presence of ammonia in the perspiration during disease, the statements of chemists and other observers are devoid of precision; for we still require to know whether or no the ammonia exists in a free state at the time, or even after the formation of the sweat, or, whether it is evolved by the combination of the acid which neutralizes it with another base. ANSELMINO found a larger proportion of ammonia in the sweat after an attack of gout than in any other case. BEREND states, that the sweat in putrid and typhoid fevers is ammoniacal. That it sooner becomes ammoniacal in these maladies than in any others, owing to a greater amount of animal matter contained in the perspiration, appears to be nearer to the truth. It may, however, be admitted, that all sweat of a putrid odour either contains free ammonia, or sooner becomes ammoniacal. According to NAUCHE, the sweat in nervous diseases soon becomes alkaline. On this, and other topics connected with the chemistry of the secretions and excretions, SIMON and others are loose in their statements and in their authorities.

32. *c.* The *salts* are often much increased. PROUT observed a great increase of the chloride of sodium. After attacks of gout, and in the gouty and rheumatic diathesis, the phosphates of lime, as well as the urates, are increased as respects either their proportions in the sweat, or the absolute quantity excreted. In critical, and in colliquative sweats, the proportion of the usual solid constituents differs remarkably, although the amount of difference is not ascertained; and there is every reason to infer, that in these, and in exanthematous, low, putrid, and pestilential maladies, there is a considerable change, especially an increase in the fatty, extractive, and saline ingredients of the perspiration; and that, moreover, substances not usually found in the sweat, may, in these diseases particularly, be detected in it. ANSELMINO and STARK say, that *Albumen* has been found in the perspiration in cases of rheumatism, and in gastric, putrid, and hectic fevers. *Fat* has been found in the perspiration in colliquative and low maladies by myself in several cases; *uric acid* and urate of soda have been detected in the sweat of arthritic persons, and cases of gravel; *bilin* and *biliphæin*, in the perspiration of persons who are jaundiced; and the red colouring matter of the urine, *Uroerythrin*, in the perspiration in rare cases of fever. The colouring particles of the blood have been seen in the perspiration in scorbutic cases, and in putrid and pestilential maladies, in rare instances.

33. *d.* Various substances foreign to the œconomy have been detected in the perspiration after their ingestion. The chief of those are sulphur, mercury, iodine and iodides, assafœtida, garlic, saffron, indigo, prussian blue, turpentine, &c. These may be partially altered, or combined with other materials; and many other substances, even when digested, during their partial excretion by the perspiration, or by means of certain of their constituents, impart an odour to this excretion, by which even the nature of these substances may be recognised. Although these circumstances are of little importance as signs of disease, yet they should be held in recollection when the *odour* of the perspiration is estimated as a means of recognising certain maladies, and they ought to be viewed as furnishing proofs of the part which the skin performs as an excreting organ.

34. *E.* The *odour* of the sensible and insensible perspiration has not been sufficiently attended to, in the recognition and diagnosis of disease. An experienced and closely observing physician will often at once perceive the nature of the malady, from the *odour* of the effluvium proceeding from the body of the patient, even before he may have seen it or approached it. This is especially manifested by exanthematous and pestilential fevers; and although many, whose sense of smell is not acute, are incapable of distinguishing disease by this sense, others are often at once thus enabled to recognise the nature and even the progress of the malady. Most of those specific diseases which are propagated by the effluvia proceeding from those already suffering from them by infection, impart a more or less peculiar, and generally an offensive odour; and although this odour and its resemblances may be familiar to the observer, yet he will rarely be able to describe it in terms which will make it accurately known to another. The effluvium from persons in pestilential cholera is especially offensive and sickening, and it always imparts a sense of depression to those who perceive it. That from small-pox, or scarlet fever, or measles, differs from each other, or is peculiar to each. The odour of the sweat of persons in putro-adynamic fever and scurvy is generally of a putrid character. That of rheumatic and gouty persons is usually acid. Females in puerperal fevers exhale a peculiar sweetish acid odour. Persons whose intestinal excreting functions are insufficiently performed — whose bowels are much confined, are often subject to a particularly offensive, as well as an increased perspiration. The determination of the odours of the perspiration in diseases is, however, quite subjective, and different observers generally describe them by different resemblances, which are not always assigned with accuracy. Thus the perspiration of persons with itch is said to have a mouldy odour; that of scrofula to resemble the smell of sour beer; that of syphilitic patients to have a sweet odour; and that of ague is said to smell like fresh-baked brown bread. The odour of the perspiration in disease, especially in respect of infection, has been imperfectly attended to, although deserving of attentive observation.

35. *F.* The *other sensible or physical qualities* of the perspiration consist chiefly in those which have been partly noticed when describing its chemical conditions. An acid or an alkaline state of the sweat may readily be ascertained by the usual test-papers; but the acid or alkali present is determined with much greater difficulty. The appearance of the linen generally shows the presence or absence of the colouring matter of the bile; and even common bibulous paper will often demonstrate the existence of fatty or oleaginous matters. A watery and copious sweat is commonly produced, in the previously healthy, by exertion, by increased temperature, and by diseases of simple vascular excitement, when the other emunctories are duly discharging their functions. In these circumstances, the perspiration is warm, copious, watery, and without mor-

bid odour. In low, putro-adynamic, colliquative, and pestilential maladies, the sweat may be abundant, thick, clammy, cold, and variously altered in chemical constitution, especially in the amount of animal extractive matters, in epithelium scales, in saline ingredients, in odour, and in the changes it evinces soon after being collected; but in all these particulars, further and more accurate observations than we yet possess are required.

36. v. The Nutrition of the Body is one of the first circumstances which attracts the attention of the physician; the character as well as the amount of nutrition appearing to him of great importance. The diminution or abundance of adipose substance; the amount of emaciation or of obesity; the size and tone of the muscles; the rigidity, firmness or flaccidity of the flesh; the colour and state of the integuments, and the presence or absence of intumescence, œdema, anasarca or leucophlegmasia, are appearances which always interest the medical observer. — *A. Emaciation* is, when very remarkable or excessive, of great consequence in our estimation of the nature and ultimate issue of disease. In all cases when it is considerable, and especially when very great, it requires close consideration in respect both of its causes and of its morbid relations. — *a.* Emaciation increases rapidly in low, continued, remittent, and hectic fevers, the degree of emaciation, and the rapidity of its progress indicating the severity and danger of the malady. In organic diseases of the lungs, stomach, and digestive organs generally, emaciation is always present, the acceleration of its course, and the degree to which it has advanced, furnishing proofs of the danger to be expected, especially when it is attended by quickness of pulse and other febrile symptoms. In acute or febrile phthisis, the rapidity and the extreme degree of emaciation are amongst the most prominent and fatal indications furnished by the malady, and may be the most remarkable when cough and expectoration are the least observed. In all diseases which tend to inanition — in structural changes in the œsophagus, cardiac and pyloric orifices of the stomach, and in the mesenteric glands, emaciation advances more slowly, but to an equally great extent. In the more chronic states of phthisis, in diseases attended by augmented secretion or morbid discharges, emaciation is slower in its progress, but it also becomes extreme, if the malady receives no check, or is not removed by treatment. In continued fever emaciation seldom is apparent until the period of vascular excitement subsides, but after this period it advances rapidly — the more rapidly the greater the danger, more especially in the intestinal or gastric complications of fever. When with rapid or extreme emaciation there is also a dusky, lurid or livid hue of the surface, the danger is very great; and if eschars, &c., form on parts which are pressed upon, it is still greater.

37. *b. Partial emaciation* is observed chiefly in paralysed limbs or diseased parts, and depends upon the inaction of the muscles of these parts for a long period. In many cases the muscular emaciation is concealed by a degree of œdema or leucophlegmasia, which often affects the paralysed limb. In all cases, therefore, it is of use to know to what extent the emaciation is that of the adipose tissue, or of the muscular structures. In the slighter forms the adipose tissue only is diminished, whilst the muscles are but little diminished, but in extreme cases the muscles also become extremely flabby and ultimately wasted.

38. *c. Arrest of the progress* of emaciation, and a more or less marked restoration of the flesh, and especially if there also be a restoration of strength and of the natural hue of the surface, are amongst the most favourable indications of returning health, and of the removal of the pathological conditions upon which emaciation depended. *The superabundance* of adipose tissue is noticed in the articles Adipose Tissue, and Obesity.

39. *B. Flaccidity* of the soft-solids of the body may precede or accompany emaciation, or even œdema, anasarca, &c. But, however attended, it is always an indication of debility or exhaustion, and often in connection with impaired nutrition. In fevers, especially flaccidity of flesh, is attended by discolouration of the surface (§§ 16, 17.), and, as they proceed, by alteration of the blood, especially as respects the hæmato-globuline and saline constituents, by anæmia, by absorption of the adipose substance and emaciation. During low fevers, and in the more inflammatory states of fever, after the stage of vascular excitement has abated, flaccidity of muscles, absorption and emaciation proceed rapidly. Nutrition is arrested from the commencement of the malady; and, although the arrest is not manifest at an early stage, it has nevertheless taken place, the capillary turgescence, arising from febrile or vascular excitement, preventing it from being apparent.

40. Where flaccidity is most remarkable, emaciation not having advanced far, the flesh has often unnatural *softness*, especially in the leucophlegmatic temperament; and in some cases, the softness and flaccidity are either unattended by apparent emaciation, or characterised by turgescence, the unanimated or partially discoloured hue of the surface, suggesting the idea of an unhealthy, watery, or semi-liquid state of the adipose and cellular parts below the integuments. This condition is intermediate between the natural and the œdematous or anasarcous state, and is aptly called *leucophlegmasia*. When partial it often passes into œdema, intumescence being then very considerable, the surface *pitting* from pressure; and when more general it may pass into *anasarca*, the watery effusion into the cellular and adipose tissues being such as to produce great distension of the integuments, with pitting, &c. This *leucophlegasia* is always an important sign of disease; and is often attended by anæmia, or rather by poorness of the blood — by a deficiency of hæmato-globuline. When this state is very marked, whether there be emaciation or intumescence, chronic disease of the digestive and assimilating organs may be inferred, and consequently impaired or morbid nutrition. Attention, in these cases, ought to be directed not only to these organs, but also to the functions of the kidneys and to the cardiac signs. In females, the uterine functions are generally more or less disordered, when this sign of disease is present, and when there is also a yellowish or jaundiced tint of surface, organic change in the biliary apparatus may be inferred, which commonly terminates in ascites, or even in more general dropsy.

41. vi. The Organs of Voluntary Motion—

the locomotive organs — are variously and seriously affected by disease, owing chiefly to the states of the nervous centres, by which the muscular apparatus is actuated, but, in many maladies, to the conditions also of organic nervous energy of the muscles themselves, and of the blood. Loss of motion or of sensibility, or of both, in a part, or in one-half, or in the whole of the body, has been fully treated of under the head Paralysis. But the locomotive organs may be more or less paralysed, or similarly affected, in maladies which have not been usually termed paralytic. — *A.* In adynamic, putro-adynamic, typhoid, typhus, and exanthematous fevers, the loss of muscular power is very marked, even from the commencement; and in these maladies it is not to be so much imputed to the state of the brain, spinal chord, and their envelopes, as to that of the organic nervous system, the muscles themselves, and ultimately the blood, being influenced by this system. So remarkably are the locomotive organs affected, in these, and in all low or malignant fevers, as to render them incapable of retaining the standing or sitting positions, or even a position on either side, the patient being constantly supine. The degree in which voluntary muscular power is prostrated is remarkably great in all these fevers, the amount of danger being partly manifested by the degree of prostration, and the inability to lie on, or turn to, either side. Amongst the most favourable and earliest signs of recovery is the return of the power to lie upon either side, and afterwards the capability of turning from the one to the other. (§§ 4, 5, 6.)

42. *B.* But muscular power is not only *lost* or *prostrated*, in the modes evinced by palsy and low fevers, but is also otherwise affected, and in various ways. Owing to changes implicating the nervous centres of animal life, the muscles are frequently capable only of imperfect, uncertain, indeterminate, or irregular contractions; the motions of the limbs or members being similarly characterised. These morbid states of voluntary motion are apparent only upon efforts at locomotion, or on volition; but other morbid states of motion occur and continue in opposition to volition, and consist — 1st. Of continued tremor; — 2nd. Of frequent, or continued contraction and relaxation, with uncertain or imperfect voluntary motion, as in chorea; — 3rd. Of spasm or cramp, of short or momentary duration; — 4th. Of spastic or permanent or continued contraction of one or more muscles; — 5th. Of more or less general spasm, followed by partial or more general relaxation or irregular action, as in epileptic and convulsive seizures; — and 6th. Of continued general spasm, as in tetanus. These states of locomotive function present numerous associations and relations, which serve both to characterise specific forms of disease, and to indicate the issue of the disease in which they are observed.

43. (*a.*) The *prostration* of muscular power observed in low fevers is always attended by flaccidity of the muscles, indicating impairèd rigidity and tone of the muscular fibres, and loss of irritability; and by a harsh, discoloured, or lurid hue of the surface, evincing a morbid state of the blood, and of the functions of the capillaries. These states show the propriety of having recourse to such agents as will most efficiently promote or rouse organic nervous energy, restore the excreting or depurating functions, and counteract the morbid or contaminating changes taking place in the blood. Unless the conservative influence of life be supported by these measures — unless vital resistance to contaminating or hurtful influences be thus promoted, prostration of muscular power, and sinking of vital function, proceed with increased celerity, and soon terminate in dissolution; a favourable crisis, taking place on some occasions only, by means of vital resistance, and the spontaneous action of an important emunctory thereby developed under the favourable circumstances of locality, of constitution and age.

44. (*b.*) The *imperfect and indeterminate contractions* which follow volition are generally occasioned by exhausting discharges, by masturbation or premature or excessive sexual indulgences, and are followed by general palsy, and often also by imbecility. The general palsy of the insane is of this nature, and, although life may be protracted for years, it is generally shortened in the manner shown in the articles on Insanity (§ 170.) and Palsy (§§ 65. *et seq.*). — In these cases the cerebro-spinal centres are often more or less wasted or altered in their intimate organization; and frequently little or no aid is derived from medical treatment, or even from diet or regimen.

45. (*c.*) *Continued tremors*, or constant shaking of a part — of the head, of an extremity or limb, &c., — or frequent twitchings of a muscle or part, are commonly indications of irritation at the origins of the nerves supplying the affected parts, or of some changes disturbing these nerves. When this sign consists of either shaking or tremor, it may continue for many years, the patient often reaching the usual duration of human existence; but it is rarely or never controlled by medical treatment, although life may be prolonged by a regular and abstemious regimen and diet. The *twitchings* which sometimes affect one or more muscles, especially the muscles of the face, are generally much more serious signs, and although they may continue for years, yet they generally terminate sooner or later in apoplexy or palsy.

46. (*d.*) *Cramps or spasms* may depend upon irritation of the bowels by acidity or flatulence, and, when they affect the lower extremities in the gouty diathesis, they generally proceed from this source, and are often connected with the presence of morbid or effete matters in the circulation. More *permanent or protracted spasms* generally proceed from inflammatory action in those portions of the nervous centres where the nerves originate that supply the contracted muscles; and these are often the forerunners of palsy, are sometimes associated with palsy of adjoining parts, or of opposite limbs, and are often followed by apoplexy or coma.

47. Cramps or spasms, varying in character with existing pathological conditions, occur in various diseases. They often effect the muscles of the lower extremities, when the intestinal canal is violently irritated, and often also the abdominal muscles. Although indicating a severe state of disease, they are seldom attended by danger unless they extend to the superior extremities, or are symptomatic of pestilential cholera, or of the ingestion of acrid, or of irritant and depressing poisons (see Art. Poisons, *pleuries*). When they occur in the course of phrenitis, of apoplexy, or

of palsy, they are unfavourable symptoms, and indicate at least a severe form of disease, passing into organic changes in parts of the nervous centres. They are also most serious indications when they occur in fevers and in puerpural females. The same remarks apply to *convulsions* appearing in the circumstances now mentioned, unless they are symptomatic of hysteria. (See ARTS. CONVULSIONS, EPILEPSY, HYSTERIA, &c.)

48. Muscles are sometimes singly affected, or the affection extends merely to such muscles as are supplied by a single or by a pair of nerves; and the affection may be either that of *paralysis*, or of *spasm*, or the latter followed by the former. These partial or limited affections are often important indications of the early stages of structural changes in those parts of the nervous centres connected with the origins of the nerves supplying the affected muscles. When one or more of the muscles of the face are thus affected, unless a manifest cause exists in the course of the nerves supplying them, then more serious results may be expected, in the form either of apoplexy, or of convulsive coma, or of more complete or general palsy. If the muscles of the tongue or of the pharynx be implicated, in either of the modes just stated, structural changes at the origins, or in the course of their nerves, may be inferred, which will sooner or later terminate in an apoplectic seizure, or in hemiplegia. When these muscles are so affected as to prevent articulation, or deglutition, or both, an apoplectic attack, rapidly terminating in death, generally ensues after no very long interval. Prolonged spasm or contraction of the hands or feet, or of both, is observed in infants and children, in connection with cerebral disease, and often also with laryngismus: it is always a very dangerous symptom.

49. Muscular movements are affected by disease in every form or grade from complete loss of the power of contraction, to impaired weak, or irregular or uncertain contraction, involuntary twitchings, clonic or atonic spasms, or convulsive movements, spastic or protracted contractions, and tonic or tetanic contractions of a prolonged and general kind. These grades of diseased muscular action are not progressive; they are seldom consecutive or progressive, but one or other generally appears independently of the rest, and, if one state or form supervenes on the other, that of spasm is most frequently followed by paralysis, this latter being rarely followed by spasm. These several and very different forms of muscular affection are common in infants, in children, and are not infrequent in adults and aged persons. In young subjects, especially in children, they are more frequently sympathetic, of irritation of the digestive canal, of teething, of intestinal worms, although sometimes proceeding more directly from alterations in the nervous centres or their envelopes; whilst in adults and aged persons they more frequently arise from these latter morbid conditions. But whatever changes of a structural nature may induce them, they may severally appear in different or even in opposite states of the vascular system — in states of anæmia or deficiency of blood, or of natural fulness, or of excessive plethora; and these different conditions of the vascular system are not especially allied to particular forms of disordered muscular action, for, with vascular anæmia, loss of motion, or impaired or uncertain motion, or clonic spasm, or convulsions, or even protracted spasm, may take place, although clonic or atonic spasm or convulsion is the most common. The same remark applies to other states of the vascular system, for, even when loss of motion may be most complete, vascular fulness may be greatest, and, even when spasms are most general and protracted, as in tetanus, and in its several modifications, the vascular system may be equally exempt from deficiency and fulness of blood. All disorders of the muscular movements require close observation and most particular investigations into the pathological states producing them. They are of most serious import, especially in adult and aged subjects, unless when symptomatic of hysteria or gout, and even then they ought not to be undervalued; and, unless they are referred to inflammatory action in some part of the nervous centres or thin envelopes, they are seldom benefited by large vascular depletions; or, if depletions be indicated, they ought to be employed with caution, those which are local or derivative being the most serviceable. Much more frequently very opposite means to vascular depletions are required, especially tonics, antispasmodics, stimulants, &c., variously conjoined with other means, according to the changes inferred in each form of these disorders, and in each case which comes under treatment.

50. C. *The joints and ligaments* furnish signs which are intimately connected with constitutional diathesis, and with disorders of the digestive and vital organs. In the gouty and rheumatic diathesis, they are not only the most frequent seats of disease, but also the parts to which attention should be directed in forming an opinion as to the recurrence of disorder or the means of averting it. A tumid condition of the joints, and relaxation of their ligaments, whether appearing singly or in conjunction, are certain indications of predisposition to disease, even when little disorder besides is manifest. The former of these, especially when associated with a marked development of the lymphatic system, or with enlargement of the glands, or fairness of skin, &c., is a certain sign of the scrofulous diathesis; whilst the latter is connected with constitutional debility; and is very frequently the consequence of masturbation. Primary debility and consecutive exhaustion, in these manifold conditions, are always attended by a weak or unusually flexed state of the joints; and whether appearing in childhood, or in later periods of life, the joints and ligaments most prominently betray these conditions. The more vigorously the joints and ligaments perform their offices, the more perfectly are the several vital functions performed. When the joints swell, or are puffed, in the advanced course of the severer cases of small-pox, or of scarlet fever; or at an advanced stage of puerperal phlebitis, or even in other forms of phlebitis, or in erysipelas, secondary inflammation and consecutive suppuration, in these parts may be considered to have either commenced or somewhat advanced. There are no external parts, which more certainly evince depression of organic nervous or vital power, or more frequently experience the injurious effects of infection or contamination of the blood — whether animal or external infec-

tion, or self-contamination by suppressed excretion or morbid absorption — than the joints, as I have shown and explained when treating of the Sympathetic Associations of Disease (§§ 21, 72.).

51. Not only the large, but also the small joints are objects of attention in disease. The latter are often the seats of painful affections, especially in females after the menstrual epoch of life, or during far advanced age, these affections partaking more or less of a rheumatic or of a gouty character, or of both. They are generally dependent upon disorder of the digestive and biliary organs and impairment of the excreting functions of the skin and kidneys. The last joints of the fingers are often enlarged in phthisis, whilst their ultimate extremities are wasted, and the nails are uncated or bent over the wasted tips of the fingers. In most diseases of debility or exhaustion, and in febrile maladies, the motions of the joints, and especially the remarkably impaired power of sustaining the weight of parts superimposed when the limbs are extended in attempting to stand erect, evince the degree of vital depression, and the loss of muscular and nervous energy.

52. The extremities also beyond the larger *joints* become the seats of *emaciation*, or of *œdema* — of the *former* in protracted chronic diseases and in those just named, of the *latter* especially when the limbs are depending, or when the venous or lymphatic circulation is interrupted by pressure, or by vital exhaustion or other causes. When œdema or swelling of one or more extremities occurs from the pressure of internal tumours, or appears in the last stage of phthisis, it is an unfavourable sign; in the latter disease especially, it generally ushers in a fatal issue. It is a very prominent sign of inflammation of the lymphatics, or of the veins, or of both; and it sometimes occurs in artereitis. In phlegmasia alba dolens, the swelling is very great, with little or no pitting by pressure, the veins and lymphatics being generally obstructed, and the adipose and cellular tissues loaded with a semi-coagulated lymph. Œdematous swellings of the extremities are always unfavourable signs when they appear in the course of prolonged internal maladies, especially upon diseases of the heart, kidneys, lungs, liver, or spleen; or upon ovarian disease, or aneurism, or internal abscess, or tumour. If œdema affect one arm it is generally unfavourable, although no disease of the heart, lungs or pleura can be detected. Swelling of the arm is a very important sign of tumours, especially cancerous diseases of the mamma, as showing that the lymphatics, or even the veins, have become affected. Œdema of the lower extremities, when owing chiefly to debility, or to a depending position, or to both, or to the pressure of the gravid uterus, or of fæcal accumulations in the cæcum or sigmoid flexure of the colon, generally disappears after the removal of the cause.

53. The *nails* of the fingers and toes, and the *hair* are often affected by internal as well as external maladies. The *nails* frequently manifest cachectic states of the system. They become elongated and uncated, or bent over the wasted tips of the fingers in phthisis; often also blue in this malady and in other diseases of the lungs and air-passages, when the blood is not sufficiently changed by respiration, and in congestion of the heart or lungs. They, with the fingers, assume a still more livid hue towards the fatal termination of these diseases, and during the collapse of pestilential cholera. The nails and matrix, or secreting structure of the nails are altered, the former becoming thick, or brittle, dry, &c., in several chronic cutaneous affections, especially in psoriasis lepra, pityriasis, &c., evincing an obstinate form of those affections. The nails partake, to some extent, of the alterations of the cuticle, in acute and chronic diseases attended by exfoliation of this tissue; the hair also becoming implicated.

54. In acute or febrile phthisis, in exanthematous and in continued fevers, the *hair* falls out, becomes thin, dry, weak and straight. This affection of the hair is not very marked in chronic phthisis, and it does not occur until the most advanced stages of, or in the course of convalescence from these fevers. The hair falls out more slowly in consequence of the syphilitic and mercurial poisons, of masturbation, of premature or excessive sexual indulgences, of mental exertion, and the depressing passions. It becomes prematurely *grey* from pityriasis, from sudden mental shocks, from the depressing emotions, from excesses of all kinds. Loss of the hair, premature greyness, and exuberance of the hair, are severally more or less hereditary in families. The loss, greyness, or want of lustre of the hair, depends upon defective nutrition or atrophy of the follicular bulbs of the hair. (See Art. Hair.)

55. II. Symptoms and Signs furnished by the Senses and Nervous System of Animal Life. — The *signs* furnished by *the organs of sense*, are dependent on the states of the brain, although often more or less influenced by the organic nervous system. The intimate dependence of the senses upon the brain is evinced most remarkably by the *eyes*, and less so by the function of *hearing*. The sense of *smell* is influenced by the respiratory functions and states of the brain and respiratory passages, whilst the brain is often affected through the medium of this sense. *Taste* is very closely connected with the digestive and organic functions. The sense of *touch*, whilst depending on the brain, requires the media of transmission to the brain to be capable of conveying the impression which touch produces. In all cases, it is necessary to *perception* through the medium of any of the senses — 1st, that an impression be made on the sense; — 2nd, that the nerves of sense should be in a state capable of transmitting the impression to the brain; — and 3rd, that the brain should be able to perceive the impression which has thus been made. The impression made on the senses may fail in either of those quarters or channels. — (*a*). The impression may fail owing to the *organ* of sense not being in a state to receive it at all, or to receive it in a normal manner, — as the eye or ear from disorder or disease; or the organs of smell and of taste, from diseases of the respiratory and digestive organs, with which they are connected. — (*b*.) It may not be perceived from the circumstance of the nerves of sense not being capable of transmitting the impression to the brain, as in cases of atrophy, injury, wounds, &c., of these nerves, or of tumours, morbid deposits, &c., pressing upon them: — and, (*c*.), the impression may not be perceived, although received and transmitted, owing to the condition of the brain at the origins of these

nerves in the brain, or at the seat of conscious sensation. — (*d.*) While these are the requisites for the discharge of the functions of sense, diseases of other organs influence these functions, in one or other of these three quarters — by implicating or disordering either the organ of sense, or the nerves communicating with the brain, or the brain itself.

56. Disorders of the functions of sense are of importance according to the sources to which they may be traced. They are most serious or dangerous when they can be referred to the brain; much less so when they proceed from the nerves of sense or from the states of the organs of sense, and least so when they are sympathetic, or depend upon the digestive functions. Owing to diseases of one or more of these quarters or sources, the functions of sense may be suspended, destroyed, diminished, depraved, or exalted; these several conditions depending upon any one of these sources, or upon two or more of them. They may be abolished or suspended in fevers, apoplexy, palsy, &c.; they may be depraved or altered in nervous fevers, and in diseases of the respiratory and digestive organs; they may be diminished or impaired, in these and many other maladies, and they may be exalted early in fevers, in inflammations of the brain, spinal chord, or their membranes, and even in hysteria and hypochondriasis. It is so far favourable when the senses continue unaffected in acute diseases; and a return of their functions after a crisis in these diseases, or in conjunction with other early favourable symptoms, is a fortunate concurrence.

57. i. The Signs presented by the Eye are amongst the most important which are furnished by the senses. The volume, the position, the motions, the colour, the brightness and expression, the states of the several tissues, and the functions of the eyes demand a particular notice. The pathological changes of the organ are described in the article Eye, the sympathetic and symptomatic indications furnished by it are now only to be considered. — (*a.*) The *size* of the eye is changed chiefly in hyperæmia of the tissues of the organ, in congestions of the brain or of the heart or lungs, by impending suffocation; in apoplexy in phrenitis, in the paroxysms of epilepsy and convulsion, in delirium tremens, &c.; but the increased size is not great, the apparent increase being caused more by the prominence given to the organ by congestion or turgescence of parts posterior to it, than by the distension of its tissues. In these cases, the volume and prominence of the globe are rapidly or acutely increased; but they may be augmented in a much slower and more remarkable manner, in several chronic structural changes of the organ. (See Art. Eye, *pluries.*)

58 (*b.*) The eye may be *protruded* slightly by turgidity of the tissues behind it, giving it also an apparent increase of size; and more remarkably by tumours, by aneurisms, by exostosis or osteosarcoma, by disease of the periosteum, or of the lachrymal gland; by structural changes of the membranes, bones, &c., and by inflammation of the adipose tissue behind the eye. The position of the organ may be variously altered by these maladies. The eye may be directly protruded, or it may be forced, or turned to one side.—*Sinking* of the eye (§§ 8.), is caused by absorption of the adipose substance behind the globe, by diminished turgescence of the vessels, and partially by an atrophy or lessened fulness of the tissues and humours of the organ. Sinking of the eyes is generally equal as to both, as it depends upon constitutional causes, and, when very remarkable, it is always a sign of a severe or dangerous malady. Where only one eye is sunk, a local affection of the brain, or atrophy of the nerves of the eye, or paralysis of these nerves may be inferred.

59. (*c.*) The *motions* of the eye may be affected by paralysis, or spasm, or by debility, exhaustion, &c. Immobility and wrong direction of the globe, may arise either from paralysis or spasm, and are signs of disease of the brain or of its membranes, especially congestion, effusion of fluid, hæmorrhage, softening, or any of the alterations productive of apoplexy, palsy, coma, convulsions, &c. Immobility is observed chiefly in catalepsy, apoplexy, and profound coma, and indicates a severe or very dangerous state of the latter. A faulty direction of the eye-ball, when permanent, depends chiefly on paralysis of the muscles on the side opposite to that to which the eye is turned, and more rarely to contraction of the muscles of that side. Squinting is a sign of organic alteration of the membranes or substance of the brain; is most frequently seen in hydrocephalus, in convulsions, apoplexy, cerebral inflammations, palsies; and is a most unfavourable or fatal sign of these maladies, the exceptions to this issue being few. During crises, or when it is observed in cases of worms, or in the paroxysm of epilepsy or hysteria, it is not so dangerous as in the foregoing maladies. Congenital or acquired squinting — acquired from habit — has no semeiological import.

60. Distortions of the eyes, of a passing or temporary kind, are produced chiefly by spasms of the ocular muscles, and occur chiefly in convulsive affections, in the diseases just mentioned, and in several acute maladies. When they are observed on the invasion of acute diseases, especially in any of the exanthemata, as small-pox, a most severe or dangerous attack is then indicated. If they appear in an advanced stage of cerebral diseases, of exanthematous or continued fevers, or in low or putro-adynamic fevers, the prognosis is still more unfavourable, or even fatal.

61. (*d.*) The *colour* of the conjunctiva should not be overlooked: redness of this coat is a sign of congestion or inflammation, either of it, or of congestion or inflammation of the brain or its membranes. The redness is most frequently the result of irritation from mechanical causes, or of catarrhal inflammation. When it is produced by acute sthenic inflammation then the conjunctiva is also much swollen. In the asthenic states of conjunctivitis, and in scurvy, the colour is a dark red. In apoplexy, in cerebral fevers, and in typhus, the conjunctiva is generally more or less congested and red; and frequently also in cases of vascular determination to the brain, especially in the morning before leaving bed. *Ecchymoses* of the conjunctiva are sometimes also observed in these maladies, and after epileptic or other convulsive attacks, these changes of this coat indicating a severe or dangerous disease. If the injection or congestion of the conjunctiva present a dirty brownish, or livid hue, not only cerebral congestion, but also alteration of the blood may be inferred, and a most unfavourable or fatal prognosis may be formed, especially in putro-adynamic

fever, typhus, small-pox, scarlet fever and measles. Other changes in the eye connected with simple, gouty or rheumatic inflammation, and the several alterations of structure of this organ, are described in the article Eye.

62. (*e.*) The *form and size of the pupil* are much affected in cerebral diseases, and in other maladies, through the medium of the sympathetic nervous system. A *contracted* pupil is observed in active vascular determination to the brain, in inflammation of this organ or of its membranes, in the early stage of irritation or scrofulous disease of the brain, before passing into effusion, in retinitis, and in poisoning by opium. When it occurs in apoplexy, or when one pupil is contracted whilst the other is dilated, either in apoplexy, palsy, or epilepsy, an unfavourable prognosis may be formed. A *dilated* pupil occurs in an advanced stage of hydrocephalus, in coma, and in all diseases of the brain attended by effusion or pressure, as apoplexy, the last stages of phrenitis, and meningitis. It may occur also after epilepsy, convulsions and hysterical fits; and it may be produced by some narcotic Poisons. Its connection with amaurosis and cataract should also be recollected. Dilatation of the pupil is observed in cases of intestinal worms, and often in scrofula, the early stage of phthisis, and in several chronic abdominal affections, especially in children. When it follows rapidly on a contracted pupil, during cerebral affections, effusion or organic alterations may be inferred, the latter especially if any difference in the state of both pupils be remarked.

63. The *motions* of the *iris* should always be noticed in connection with the size of the pupil. The iris may be unaffected by light, owing either to spasm or paralysis; this want of motion being most frequently remarked in the cerebral maladies already mentioned, and in typhoid and low fevers. In these, as well as in other maladies, of a severe or dangerous nature, this is a most unfavourable sign. Increased sensibility of the iris, with quick dilatation or contraction, is observed chiefly in hysterical and irritable or sensitive states of the frame; and in the early periods of exanthematous or other fevers. It is also remarkable in diseases of debility, or in cases of vital depression, when the functions of the brain are unimpaired.

64. (*f.*) The *lustre* of the eye depends chiefly on the state of the brain. It is increased in active determination of blood to, and in inflammations of, the brain or its membranes, until effusion, exhaustion or coma supervene. Increased lustre is sometimes observed in apoplexy; it precedes and accompanies the delirium of fevers; and attends several states of insanity. The lustre of the eye is impaired on the invasion of most infectious maladies; in congestive affections of the heart, lungs or brain, and in severe diseases of the abdominal organs. The lack of lustre is further increased in the last stages of acute diseases, especially when the blood is contaminated, as in malignant or pestilential maladies; and is always a very unfavourable sign. It is often a fatal indication in inflammations of abdominal organs, and in these it evinces the occurrence of gangrene or fatal sinking. A glazed appearance of the eyes generally precedes dissolution.

65. (*g.*) The *expression* or *look* of the eye, or the impression made by the eyes of the patient on the observer, is generally either that which is natural or usual, or that of anxiety, of terror, fright or despair, or of wildness or madness. The expression of the eye generally harmonizes with that of the countenance. The *natural look* of a patient's eye is always a favourable circumstance in both acute and chronic diseases. A *timid* or *mild expression* is observed on the invasion of acute diseases, and before vascular reaction is developed, and towards the termination of dangerous chronic maladies. It is also seen in hysteria, in disorders caused by self-pollution, and hypochondriasis. A *timid, furtive, downcast*, or *unsteady* look is common in the disorders of the mind. An *anxious expression* is observed in diseases of the heart, and of the respiratory passages, when the respiratory efforts are difficult, and in inflammations of the stomach, bowels or liver. A look of *fright* or *despair* occurs in alarming cases of hæmorrhage, in violent colic or ileus, in strangulation of the bowels, in pestilential cholera, sometimes in acute inflammations of the digestive canal, and in accidental poisoning. It is always an unfavourable, and frequently a fatal sign. A *wild, terrified* or maddened expression characterises the paroxysm of rabidity, the accession of delirium and mania, delirium tremens, and phrenitis or meningitis.

66. (*h.*) The *function of vision* is variously affected in disease, either with, or without, *increased* or *diminished sensibility of the eye* to light. *Increased sensibility* to light (*Photophobia*) is observed in many diseases,— 1st, in diseases of the eye, especially in inflammations of the internal tissues, and in scrofulous, gouty and rheumatic affections of the organ; — 2nd, in diseases, in which affections of the eye become prominent phenomena, as small-pox, measles, catarrhs, &c.; — 3rd, in affections of the brain or of its membranes, especially in inflammations or irritations of, and vascular determinations to, this organ, whether primary or associated with febrile or other maladies. Photophobia is generally observed during the early stages, and progress of these, and before effusion or other organic changes consequent upon inflammatory action, or irritation have supervened. It also occurs in delirium, in mania and several states of insanity; — and 4th, in various diseases, in which the nervous systems generally, both organic and animal, evince increased susceptibility and sensibility, as hysteria, hypochondriasis, rabies, and during recovery from many acute maladies. *Impaired sensibility* of the eye to light often occurs in far advanced stages of the diseases, in the earlier periods of which increased sensibility is observed. The *sensibility* of the eye to light, whether increased or diminished, should not be confounded with increase or loss of the power of vision; for vision may be very remarkably impaired, when the sensibility to light is most acute, and the reverse is as frequently observed.

67. (*i.*) *Diminution or loss of vision* may arise from a variety of pathological states. — 1st, from changes in the tissues and humours of the eye itself; — 2nd, from disease of the brain, of its membranes, or of the optic nerves, or of changes implicating either these nerves or the ophthalmic branches of the fifth pair of nerves; — and 3rd, from sympathy with disease of any of the abdominal organs: from intestinal worms; from hysterical hypochondriacal and of the nervous affections;

from faintings, and from general or local debility or exhaustion (see Arts. EYE and AMAUROSIS). When loss, or even diminution of sight occurs during delirium, or in the course of fevers, and in affections of the brain, the supervention of coma, or of apoplexy or palsy, or of both, may be expected.

68. (*k.*) *Morbid* or *altered vision* presents various forms and phases. — *Near* or *far sight* depends on the different degrees of convexity of the cornea, and on the states of the anterior humours or parts of the eye-ball. Near sight (*Myopia*) is often congenital and continues through life, or nearly so. It may, however, be acquired from the constant or frequent use of the eyes at near objects, or at the same near focus. Far sight (*Presbyopia*) may occur from habitually directing the eyes to distant objects, and is common in sailors. It is still more common in advanced age. It is owing chiefly to diminished convexity of the cornea. *Interrupted* and *half vision* occurs either from a partial paralysis of the retina, which is sometimes temporary and sympathetic, or from a more permanent change in the humours or nerves of the eye. It is generally symptomatic of disorder of the digestive functions when it is not continued; but when it is constant or increases, it is caused by a change in the optic nerve or optic thalamus.

69. *Double vision* generally proceeds from disease of the brain or membranes, from effusion of fluid within the cranium, or from alterations implicating the medulla oblongata or base of the brain. It is an unfavourable sign whenever cerebral disease is indicated, especially phrenitis, apoplexy, palsy, epilepsy, &c. It may usher in a dangerous attack of apoplexy or palsy, or precede amaurosis, or it may follow the severer paroxysms of epilepsy or convulsions. It sometimes occurs on metastasis of rheumatism or gout to the brain; and it occasionally supervenes upon, or attends disease, especially inflammation of the spinal chord or its membranes, and it is then a most dangerous sign, inasmuch as it evinces the extension of disease to the base of the brain. Double vision may accompany intoxication, intestinal worms and disorders of the digestive organs, fæcal accumulations, hysteria, &c. But it is then associated with symptoms which indicate its nature, and is commonly temporary or soon removed.

70. *Vision* may be deformed, — objects being seen in inverted, crooked, disfigured, or distorted forms. This state of vision occurs chiefly in cases of chronic organic diseases of the brain, membranes, or bones of the cranium. Objects may also appear brighter or darker than they really are, or different colours, or certain colours may not be distinguished. A *brighter* or redder appearance of objects than natural sometimes accompanies irritation or inflammation of the brain or its membranes. A *dim* or *dark* state of vision may proceed from debility of the retina, or from slight turbidity of the humours, or congestion of the posterior structures of the eyes. An inability to distinguish colours, or to perceive certain colours, indicates congestion, or alteration of the intimate structure, of the retina. *Scintillations*, sparks, lights, or little fiery balls (*Photopsia*), occur in congestions, hyperæmia, and inflammations of the brain or membranes, and they sometimes precede epistaxis, apoplexy, palsy, amaurosis, epilepsy, &c.; but they may also proceed from irritation of the retina and optic nerve, and from congestion or inflammation of the more internal tissues of the eye.

71. *Dark points*, figures or nets, or reticulated spots (*Muscæ volitantes*), before the eyes, sometimes proceed from congestion, irritation, or inflammation of the retina and adjoining parts, but more frequently from slight capillary congestion of the interior structures, especially the capsules of the humours, or turbidity of the humours, or varicose states of the extreme or lymphatic vessels. These appearances, as well as others of a similar kind, may sometimes depend upon congestions within the cranium. The states of the organ from which they chiefly proceed are generally sympathetic of disorders of the digestive organs, and are often associated with chronic cutaneous eruptions. They are also symptomatic of intestinal worms, of hypochondriasis, and hysteria. They are most frequently experienced by persons who have strained or over-exerted their sight on small or near objects. These disorders of vision may be more or less manifest for many years, — for thirty or forty years, — according to my experience, without much disorder of the general health, when they are not made the subjects of local treatment, by speciality doctors or surgeons, to whom, owing to the alarm of patients, they have often furnished rich harvests.

72. (*l.*) *The seeing of objects which have no existence*—*Illusions of sight*—are common in delirium, especially the delirium of fever, in states of fright or terror, in morbid states of the imagination, in delirium tremens, in states of intoxication, in the several states of acute or chronic insanity, in meningitis, and in rabies. It occurs chiefly from irritation or congestion of the cineritious portions of the brain, and is common in typhoid, low, continued, and exanthematous fevers, and in the last moments of sinking vitality, in acute and chronic maladies.

73. (*m.*) The functions of the *lachrymal glands* are often disordered in disease. The secretion of tears is generally impeded in fevers, especially during the early stages, when all the secretions are scanty; the dryness of the conjunctiva in these diseases, as well as in exanthematous fevers, favouring the occurrence of inflammation of this membrane. Increased secretion of tears may be either apparent only or real. It is often the former, when the carunculæ lacrymales are red, swollen, or partially obstructed by inflammation, catarrh, &c. It is the latter in hysteria, hypochondriasis, in low and mentally depressed states of disease, in nervous fevers, and in the depressing mental emotions. An increased flow of tears is often most beneficial in severe mental shocks, and on occasions of mental distress: it is, however, frequently produced at pleasure, or in paroxysms of temper, by females.

74. ii. THE SENSE OF HEARING furnishes signs, which have reference,—1st, to diseases of the organ itself; 2nd, to diseases of the brain, with which this sense holds intimate relations; and 3rd, to diseases of more distant and less obviously related organs. The *first* of these have been treated of in the article EAR, and *diminution or loss of hearing*, from diseases of the *organ*, or of the *brain*, or of more *distant parts*, has been fully considered in the article HEARING. There

remains, therefore, but little further to say respecting the signs of disease furnished by this sense. *Noises* in the ears, and *ear-ache*, are also severally symptoms of disease, either of the ear itself, or of parts in the vicinity, as of the throat or pharynx, or of distant parts, or of the system generally, especially continued fevers.—*a.* The *former* often precede the accession of delirium, and attend and aggravate delirium tremens. Noises in the ears also accompany anæmia, especially that consequent upon protracted rheumatism occurring in far advanced life; and they frequently attend diseases of the uterine organs, or large losses of blood either by hæmorrhage or by excessive blood-letting. In plethoric persons, they sometimes usher in an attack of apoplexy, or of epistaxis; and they should be viewed as unfavourable signs. When they are experienced in very aged persons, especially in females, who pass sedentary lives, without exercise in the open air, although not indicating danger, they resist all means of cure, if exercise in the open air be not regularly and perseveringly taken. (See Art. Ear, *Nervous affections of.*)

75. *b. Earache* is an unfavourable symptom in continued and exanthematous fevers, especially in scarlet-fever and small-pox. In these, as well as in other constitutional maladies, and even in secondary syphilis, it indicates the supervention of a local inflammatory complication, generally extending from the throat, along the Eustachian tube to the ear, and frequently either destroying the organ, or, after effecting this, extending to the membranes and substance of the brain, as I have shown to occur on many occasions, in connection with these and other maladies (see Art. Brain, §§ 146. *et seq.*). The importance of giving due attention to earache, and other affections of the ear, with reference to their pathological and semeiological relations, is more fully shown in the articles on Earache, and on *Inflammation of the* Ear.

76. iv. The Sense of Smell has intimate relations with the brain and respiratory functions.—*A. Acuteness of smell* (hyperosmia) is often present at the commencement of irritation or inflammation of the brain or its membranes, or of nervous, typhoid and exanthematous fevers, and in hypochondriasis, hysteria, uterine affections, and often in epilepsy. It sometimes precedes the accession of mania or delirium.—*B. Want of smell* (anosmia) is occasioned by affections of the nasal membrane, in catarrhs, influenza, inflammations, &c.; and by chronic diseases of the brain, or of the membranes, or of the bones of the cranium; or by secondary syphilis, or by the progress of low or exanthematous fevers.—*C. Perversion* of this sense, or smells which are different from those perceived by other persons, or which are peculiar, or unusual, sometimes precede an attack of apoplexy or of epistaxis, or of paralysis. It sometimes attends disorders of the digestive organs, hypochondriasis, hysteria, uterine diseases, secondary syphilis, and organic diseases of the brain and cranial bones.

77. *D. The secretions* of the nose are affected in catarrh, influenza, in scrofulous affections, in continued and exanthematous fevers, in syphilis, in worms, and in various disorders of the respiratory and digestive organs.—*a. Itching* of the nostrils is a sign of the presence of intestinal worms, especially of the small-thread worm; and in females, of irritation of the sexual organs, often connected with masturbation. It occasionally precedes epistaxis, and in aged persons it sometimes is a prelude of dangerous cerebral disease.—*b. Hæmorrhage* from the nose (*epistaxis*) occurs under circumstances which have been fully described in the article Hæmorrhage (§§ 65. *et seq.*). It is often a critical discharge in febrile, inflammatory and congestive diseases, especially in congestions of the heart, lungs or brain, and in active determinations of blood to the last named organ. The occurrence of it may avert an attack of apoplexy or of palsy, when not injudiciously suppressed, especially at advanced periods of life. Passive epistaxis, the vessels being defective in tone, and the blood deficient in crasis, or poor, or contaminated, as often observed in cachectic habits, or in putro-adynamic states of fever, in scurvy, purpura, &c., is often attended by much risk, especially when these conditions of the blood and of vital power are prominently marked, and decided measures the most calculated to arrest the discharge are then required. (See Art. Hæmorrhage, §§ 15. 16. 17. *et seq.*)

78. v. The Sense of Taste is often affected in connection with disorder of the sense of smell. It is either acute, impaired, lost or vitiated in disease.—*a.* It is rarely more *acute* than natural. Acuteness of taste is most frequently observed in hysteria, hypochondriasis, in nervous affections, and occasionally in nervous fevers.—*b.* Taste is *impaired* or *lost* in catarrhs, catarrhal fevers, influenza, in acute or inflammatory indigestion, in chronic gastritis, or gastro-enteritis; in a loaded or saburral state of the digestive mucous surface. In congestive or inflammatory states of the brain, and in low, continued and exanthematous fevers. When taste is restored early during convalescence from these maladies, a favourable issue may be expected; when it does not return during advanced convalescence from apoplexy, or other diseases of the brain, or from gastric or cerebral fevers, a renewed attack or a relapse may be dreaded, especially if the sense of smell also does not return.

79. *c.* A *vitiated taste* is very common in all disorders of the digestive organs; frequently in nervous disorders, and often in affections of the respiratory passages.—*d.* The taste may be *insipid* in catarrhal affections, in periodic fevers, in mucous fevers, and in cases of intestinal worms.—*e.* It may be *bitter*, in biliary disorders, in bilious fevers, in jaundice, and in chronic and structural diseases of the liver, spleen or pancreas, especially if it continue notwithstanding the ingestion of wholesome food.—*f. An acid taste* is experienced during heart-burn, indigestion, and disorders of the digestive organs generally. It is often caused by gout, or rheumatism, or calculous affections, by flatulence, or by eructations from the stomach. *g.* A *salt* or a *sweetish-salt taste* is occasioned by the presence of small quantities of blood in the mouth, and by the expectoration of matters from the lungs containing either blood or purulent matter; and is thus present even in the early stages of pulmonary disease, especially phthisis.—*h.* A *putrid* or *foul state* occurs in gangrene of the lungs, and in syphilitic and scorbutic affections of the nose, gums or throat. It is caused also by caries of the teeth or gums, by the expectoration of puriform

matters, and by the discharge of abscesses by the mouth. It is an unfavourable sign, in pulmonary, constitutional and cachectic diseases, and in chronic maladies, especially when there is much debility or emaciation. It may occur in gangrene of any part of the digestive canal, and in adynamic dysentery, and then it should be viewed as a fatal indication.—*i.* A *metallic taste* is caused by the constitutional operation of mercury, and it often precedes the accession of salivation, or mercurial affection of the gums. It is also sometimes produced by other metallic poisons; and, in rare instances, it is experienced in agues and in chronic abdominal disorders. The states of the *tongue* are various, with or without the above alterations of taste, but they will be noticed in the sequel (§§ 101. *et seq.*).

80. vi. The Sense of Touch may be more or less altered, either in one limb or extremity, or in two or more.—(*a.*) *Acuteness* of the sense of touch is observed in irritation or inflammation of the brain, spinal chord, or their membranes. It sometimes precedes mania, delirium and apoplexy, and often attends hysteria, rheumatism, gout and hypochondriasis.—(*b.*) *Diminution* of the sense of touch, in various degrees, is observed in organic diseases of the brain, spinal chord, or their membranes, and especially when these changes are consequent upon inflammatory action, effusion or softening, or tumours. When loss of touch proceeds from these pathological states, the result is generally unfavourable. It may occur in hysteria, hypochondriasis, in chronic affections of the skin, epilepsy, delirium, syncope, &c., and then a less unfavourable opinion may be entertained. It may precede a crisis in fevers. But no dependence should be placed upon it as a sign in these cases.—*c. Perversion* of this sense occurs in chronic changes in the brain, spinal chord, or their membranes, in nervous affections, and in misplaced gout affecting the brain, or its membranes. In these cases of perversion, the sensation of some body intervening between the points of the fingers and the objects touched is generally experienced.

81. vii. The Signs furnished by Sensation or Sensibility, depend, as those evinced by the senses, either upon the state of the affected part, upon the channels transmitting sensation, or upon the medulla oblongata and parts in the centre or base of the brain, which are more especially connected with the perception of sensation, or with conscious sensation. *Sensation*, whether *animal* or *organic*, is either exalted, impaired, or perverted, or suspended in disease. It may, moreover, be variously exalted and perverted in the same case, this conjoined alteration giving rise to a variety of feelings which have been recognised by distinctive appellations. These may severally proceed from the same pathological conditions as have been mentioned in connection with alterations of the sense of touch.—*a. Exaltation* of sensibility is observed in irritation and inflammation of the spinal membranes, medulla oblongata and chord, in similar affections of the cineritious structure of the brain, in hysteria, hypochondriasis, rabies, &c.

82. *b. Diminished* or *suspended*, or *lost sensation* occurs in apoplectic, convulsive, paralytic, epileptic and catalyptic seizures, during syncope, and in all changes of the brain, medulla oblongata, spinal chord and membranes, occasioning temporary or more permanent loss of consciousness, or anæsthesia. It may accompany, in its less manifest states, continued fevers; and in its more extreme grades, it may follow delirium in the form of *sopor* or *coma*, in these and all other fevers. In all these maladies it is an unfavourable, and in many a most dangerous sign. Impaired or lost sensibility to the common wants of the economy, or to the usual or natural irritants or stimulants, or the loss of sensibility in parts not liable to the deprivation of it, is always a dangerous indication.

83. *c. Perverted sensibility*, or depraved sensation, is more generally associated with exaltation, than with diminution, of sensation. Whilst exalted and impaired sensation should be referred chiefly to the cerebro-spinal nervous system — to *animal sensibility*, depraved sensation, as respects its chief manifestations, depends upon *organic sensibility* — upon the state of the organic or ganglial nervous system. Perverted sensations referrible chiefly to animal sensibility, are itching, formication, stinging, tingling, pricking, tickling, burning, &c. They are felt in the integuments, and in the extremities — in the latter, during organic affections of the brain, spinal chord, and their membranes; and previously to, or upon recovery from, an attack of apoplexy, palsy, epilepsy, convulsions, gout, &c.; — in the former, in exanthematous fevers, either previously to, or during the appearance of the eruption, and in numerous acute and chronic cutaneous diseases. Tickling or titillation, or a sensation intermediate between this and itching, is often experienced in the soles of the feet or palms of the hands, and sometimes in other places, without any disease being either present or expected. The former of these situations may, however, be artificially tickled so as to induce violent convulsions; and, if this cause be persisted in, the result may even be fatal. Spontaneous sensations of itching and tickling may also become so distressing as to occasion convulsions, delirium, or even mania, in hysterical and nervous persons, but this is very rarely observed. A sense of burning in the soles of the feet and palms of the hands is frequent in the gouty and rheumatic diathesis, in hectic and in morbid states of the circulating fluids.

84. *B. Perverted sensations*, which are referrible chiefly to the organic nervous system — or *perverted organic sensibility* — vary very remarkably, from a sense of uneasiness and restlessness, to that of distress, anxiety, and acute pain.—(*a.*) *Uneasiness* or *discomfort* occurs in the invasion of most acute maladies, and more especially of those produced by infection; but it also is observed after the suppression of any of the secretions and excretions, and on the appearance of any eruptive disorder. It also attends most chronic complaints, especially hysteria and hypochondriasis. *Restlessness* may be considered as a higher degree of discomfort, and is generally present in the circumstances just stated, or it follows uneasiness, during the accession of disease. A most distressing state of restlessness, or that attended by more or less anxiety, is observed at a far advanced stage of chronic and often also of acute diseases. Restlessness at the commencement or at an early period of acute disease is always an indication of a most severe or dangerous attack. If it appear

remains, therefore, but little further to say respecting the signs of disease furnished by this sense. *Noises* in the ears, and *ear-ache*, are also severally symptoms of disease, either of the ear itself, or of parts in the vicinity, as of the throat or pharynx, or of distant parts, or of the system generally, especially continued fevers. — *a.* The *former* often precede the accession of delirium, and attend and aggravate delirium tremens. Noises in the ears also accompany anæmia, especially that consequent upon protracted rheumatism occurring in far advanced life; and they frequently attend diseases of the uterine organs, or large losses of blood either by hæmorrhage or by excessive blood-letting. In plethoric persons, they sometimes usher in an attack of apoplexy, or of epistaxis; and they should be viewed as unfavourable signs. When they are experienced in very aged persons, especially in females, who pass sedentary lives, without exercise in the open air, although not indicating danger, they resist all means of cure, if exercise in the open air be not regularly and perseveringly taken. (See Art. Ear, *Nervous affections of*.)

75. *b. Earache* is an unfavourable symptom in continued and exanthematous fevers, especially in scarlet-fever and small-pox. In these, as well as in other constitutional maladies, and even in secondary syphilis, it indicates the supervention of a local inflammatory complication, generally extending from the throat, along the Eustachian tube to the ear, and frequently either destroying the organ, or, after effecting this, extending to the membranes and substance of the brain, as I have shown to occur on many occasions, in connection with these and other maladies (see Art. Brain, §§ 146. *et seq.*). The importance of giving due attention to earache, and other affections of the ear, with reference to their pathological and semeiological relations, is more fully shown in the articles on Earache, and on *Inflammation of the* Ear.

76. iv. The Sense of Smell has intimate relations with the brain and respiratory functions.—*A. Acuteness of smell* (hyperosmia) is often present at the commencement of irritation or inflammation of the brain or its membranes, or of nervous, typhoid and exanthematous fevers, and in hypochondriasis, hysteria, uterine affections, and often in epilepsy. It sometimes precedes the accession of mania or delirium.—*B. Want of smell* (anosmia) is occasioned by affections of the nasal membrane, in catarrhs, influenza, inflammations, &c.; and by chronic diseases of the brain, or of the membranes, or of the bones of the cranium; or by secondary syphilis, or by the progress of low or exanthematous fevers.—*C. Perversion* of this sense, or smells which are different from those perceived by other persons, or which are peculiar, or unusual, sometimes precede an attack of apoplexy or of epistaxis, or of paralysis. It sometimes attends disorders of the digestive organs, hypochondriasis, hysteria, uterine diseases, secondary syphilis, and organic diseases of the brain and cranial bones.

77. *D. The secretions* of the nose are affected in catarrh, influenza, in scrofulous affections, in continued and exanthematous fevers, in syphilis, in worms, and in various disorders of the respiratory and digestive organs. — *a. Itching* of the nostrils is a sign of the presence of intestinal worms, especially of the small-thread worm; and in females, of irritation of the sexual organs, often connected with masturbation. It occasionally precedes epistaxis, and in aged persons it sometimes is a prelude of dangerous cerebral disease.—*b. Hæmorrhage* from the nose (*epistaxis*) occurs under circumstances which have been fully described in the article Hæmorrhage (§§ 65. *et seq.*). It is often a critical discharge in febrile, inflammatory and congestive diseases, especially in congestions of the heart, lungs or brain, and in active determinations of blood to the last named organ. The occurrence of it may avert an attack of apoplexy or of palsy, when not injudiciously suppressed, especially at advanced periods of life. Passive epistaxis, the vessels being defective in tone, and the blood deficient in crasis, or poor, or contaminated, as often observed in cachectic habits, or in putro-adynamic states of fever, in scurvy, purpura, &c., is often attended by much risk, especially when these conditions of the blood and of vital power are prominently marked, and decided measures the most calculated to arrest the discharge are then required. (See Art. Hæmorrhage, §§ 15. 16. 17. *et seq.*)

78. v. The Sense of Taste is often affected in connection with disorder of the sense of smell. It is either acute, impaired, lost or vitiated in disease.—*a.* It is rarely more *acute* than natural. Acuteness of taste is most frequently observed in hysteria, hypochondriasis, in nervous affections, and occasionally in nervous fevers.—*b.* Taste is *impaired* or *lost* in catarrhs, catarrhal fevers, influenza, in acute or inflammatory indigestion, in chronic gastritis, or gastro-enteritis; in a loaded or saburral state of the digestive mucous surface. In congestive or inflammatory states of the brain, and in low, continued and exanthematous fevers. When taste is restored early during convalescence from these maladies, a favourable issue may be expected; when it does not return during advanced convalescence from apoplexy, or other diseases of the brain, or from gastric or cerebral fevers, a renewed attack or a relapse may be dreaded, especially if the sense of smell also does not return.

79. *c.* A *vitiated taste* is very common in all disorders of the digestive organs; frequently in nervous disorders, and often in affections of the respiratory passages. — *d.* The taste may be *insipid* in catarrhal affections, in periodic fevers, in mucous fevers, and in cases of intestinal worms. —*e.* It may be *bitter*, in biliary disorders, in bilious fevers, in jaundice, and in chronic and structural diseases of the liver, spleen or pancreas, especially if it continue notwithstanding the ingestion of wholesome food.—*f. An acid taste* is experienced during heart-burn, indigestion, and disorders of the digestive organs generally. It is often caused by gout, or rheumatism, or calculous affections, by flatulence, or by eructations from the stomach. *g.* A *salt* or a *sweetish-salt taste* is occasioned by the presence of small quantities of blood in the mouth, and by the expectoration of matters from the lungs containing either blood or purulent matter; and is thus present even in the early stages of pulmonary disease, especially phthisis.—*h.* A *putrid* or *foul state* occurs in gangrene of the lungs, and in syphilitic and scorbutic affections of the nose, gums or throat. It is caused also by caries of the teeth or gums, by the expectoration of puriform

matters, and by the discharge of abscesses by the mouth. It is an unfavourable sign, in pulmonary, constitutional and cachectic diseases, and in chronic maladies, especially when there is much debility or emaciation. It may occur in gangrene of any part of the digestive canal, and in adynamic dysentery, and then it should be viewed as a fatal indication.—*i.* A *metallic taste* is caused by the constitutional operation of mercury, and it often precedes the accession of salivation, or mercurial affection of the gums. It is also sometimes produced by other metallic poisons; and, in rare instances, it is experienced in agues and in chronic abdominal disorders. The states of the *tongue* are various, with or without the above alterations of taste, but they will be noticed in the sequel (§§ 101. *et seq.*).

80. vi. THE SENSE OF TOUCH may be more or less altered, either in one limb or extremity, or in two or more.—(*a.*) *Acuteness* of the sense of touch is observed in irritation or inflammation of the brain, spinal chord, or their membranes. It sometimes precedes mania, delirium and apoplexy, and often attends hysteria, rheumatism, gout and hypochondriasis.—(*b.*) *Diminution* of the sense of touch, in various degrees, is observed in organic diseases of the brain, spinal chord, or their membranes, and especially when these changes are consequent upon inflammatory action, effusion or softening, or tumours. When loss of touch proceeds from these pathological states, the result is generally unfavourable. It may occur in hysteria, hypochondriasis, in chronic affections of the skin, epilepsy, delirium, syncope, &c., and then a less unfavourable opinion may be entertained. It may precede a crisis in fevers. But no dependence should be placed upon it as a sign in these cases.—*c. Perversion* of this sense occurs in chronic changes in the brain, spinal chord, or their membranes, in nervous affections, and in misplaced gout affecting the brain, or its membranes. In these cases of perversion, the sensation of some body intervening between the points of the fingers and the objects touched is generally experienced.

81. vii. THE SIGNS FURNISHED BY SENSATION OR SENSIBILITY, depend, as those evinced by the senses, either upon the state of the affected part, upon the channels transmitting sensation, or upon the medulla oblongata and parts in the centre or base of the brain, which are more especially connected with the perception of sensation, or with conscious sensation. *Sensation*, whether *animal* or *organic*, is either exalted, impaired, or perverted, or suspended in disease. It may, moreover, be variously exalted and perverted in the same case, this conjoined alteration giving rise to a variety of feelings which have been recognised by distinctive appellations. These may severally proceed from the same pathological conditions as have been mentioned in connection with alterations of the sense of touch.—*a. Exaltation* of sensibility is observed in irritation and inflammation of the spinal membranes, medulla oblongata and chord, in similar affections of the cineritious structure of the brain, in hysteria, hypochondriasis, rabies, &c.

82. *b. Diminished* or *suspended*, or *lost sensation* occurs in apoplectic, convulsive, paralytic, epileptic and catalyptic seizures, during syncope, and in all changes of the brain, medulla oblongata, spinal chord and membranes, occasioning temporary or more permanent loss of consciousness, or anæsthesia. It may accompany, in its less manifest states, continued fevers; and in its more extreme grades, it may follow delirium in the form of *sopor* or *coma*, in these and all other fevers. In all these maladies it is an unfavourable, and in many a most dangerous sign. Impaired or lost sensibility to the common wants of the economy, or to the usual or natural irritants or stimulants, or the loss of sensibility in parts not liable to the deprivation of it, is always a dangerous indication.

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84. *B. Perverted sensations*, which are referrible chiefly to the organic nervous system — or *perverted organic sensibility* — vary very remarkably, from a sense of uneasiness and restlessness, to that of distress, anxiety, and acute pain.—(*a.*) *Uneasiness* or *discomfort* occurs in the invasion of most acute maladies, and more especially of those produced by infection; but it also is observed after the suppression of any of the secretions and excretions, and on the appearance of any eruptive disorder. It also attends most chronic complaints, especially hysteria and hypochondriasis. *Restlessness* may be considered as a higher degree of discomfort, and is generally present in the circumstances just stated, or it follows uneasiness, during the accession of disease. A most distressing state of restlessness, or that attended by more or less anxiety, is observed at a far advanced stage of chronic and often also of acute diseases. Restlessness at the commencement or at an early period of acute disease is always an indication of a most severe or dangerous attack. If it appear

in the course of febrile complaints, it is often occasioned by the accession of some important complication, especially in children, as inflammation of the brain, spinal chord or membranes, or carditis or pericarditis. It may, however, usher in a critical discharge; but if it continue, or appear after a crisis, in acute maladies, or at a far advanced period of either acute or chronic diseases in connexion with vital depression or exhaustion, or with frequent or difficult or anxious respiration, it is always a very unfavourable or fatal sign — usually fatal when it is referred to a state of internal feeling of distress or anxiety.

85. (*b.*) Discomfort may proceed to restlessness, thence to distress, and thence to a feeling of *anxiety*, which is merely a more extreme sensation of distress. These grades of morbid organic sensibility vary somewhat in character and severity, according to the region or organ chiefly affected. The distress or anxiety attending asthma, pneumonia, effusion into the pleural cavities —*anxietas pulmonalis*—is different, and distinguished by the patient as different, from that which proceeds from disease of the heart, pericardium and large vessels —*anxietas cardiaca* —and from that which is occasioned by acute disease of the stomach, liver, diaphragm, or by the ingestion of acrid poisons, or any of the more dangerous maladies of the abdominal viscera — *anxietas præcordialis.* Always keeping in recollection the differences between mental and bodily distress or anxiety, the latter should be referred especially to the morbid impression, or suffering, experienced by the organic nerves of the affected organ. This suffering may either exist in one of the organs just noticed, or be extended to several of them, or it may also implicate the nervous system of animal life, and occasion the *anxietas nervosa*, as in hysteria, hypochondriasis, rabies, tetanus, nervous fevers, &c. A feeling of *anxiety, distress*, or *suffering*, may accompany the cold stage of periodic fevers, or the invasion of malignant or pestilential maladies, or it may accompany the accession of a crisis. In these cases, although a most severe attack may be expected, inasmuch as this sign is an indication of the serious morbid impression made upon the organic nervous system, one of the prime factors of life, yet the danger is not so great as in those cases, in which this feeling supervenes in a far advanced stage of the diseases above mentioned. When it thus occurs in this stage, when it follows closely upon acute inflammation, or when it is of long duration, the danger is very great, and even extreme in pestilential maladies — *anxietas moribundorum.*

86. (*c.*) *A feeling of cold*, as already shown (§ 19.), may exist independently of any depression, and sometimes even in connection with an increase of the animal temperature. It may be attended by shiverings, shudderings, rigors or even horrors, according to the grade or intensity of this feeling. The severity of this sensation is generally an indication of the severity of the consecutive attack when it ushers in an acute disease — either inflammatory or febrile; and it is no less an indication of danger when it occurs in the advanced course of inflammations, of eruptive fevers, and even of chronic visceral disease. Rigors are often the forerunners of dissolution when they occur in diseases, in which debility or exhaustion is very remarkable (see above, §§ 20. *et seq.*). An internal feeling of cold, if experienced on the accession of disease, indicates a very severe and dangerous attack; if felt at a far advanced stage, it proceeds from fatal sinking.

87. (*d.*) *An internal sensation of unusual heat* is frequent in acute or inflammatory diseases, and it may be present when the surface is actually cooler than natural. The feeling of heat may depend upon states of internal or central parts which do not reach the periphery even of the trunk; and it, as well as the feeling of cold, is to be referred chiefly to the changes in the organ or part in which the sensation is felt, the organic nervous system participating in these changes in an especial manner, inasmuch as it is instrumental in the performance of the calorific process. A sensation of heat, or even of burning heat, may be concentrated in internal or central parts, may accompany either open or latent inflammatory attacks, and may exist, especially in the latter, although the external surface or the extremities be cool or even cold. Local feelings of heat are indications of irritation and local vascular determinations of blood, or of inflammation, or of approaching hæmorrhages. A general feeling of heat attends the more sthenic forms of fever, both periodic and continued, especially in the stage of vascular excitement. A local sensation of heat is much more dangerous in these fevers than a general feeling of heat, and when it is experienced in these diseases it should be viewed either as the precursor of a crisis by hæmorrhage, or as an indication of the supervention of a prominent affection or complication. If the cessation of internal heat be attended by free secretion or excretion, the prognosis is favourable; but if it occur suddenly, or is followed by a feeling of cold, the prognosis is bad. The sensation of heat may change its seat, especially in nervous fevers, influenza, hysteria, hypochondriasis, and diseases of the abdominal viscera; but the amount of danger in these complaints depends upon the concomitant symptoms and signs; and chiefly upon the other conditions of the surface, with which the sensation of heat or of cold is generally associated (see §§ 22. *et seq.*).

87. (*e.*) Feelings of *muscular fatigue*, of *general malaise*, or of *exhaustion*, or of *vital depression*, or of *sinking*, are chiefly modified grades of that depression of vital power accompanying either the invasion of acute diseases, or the debility consequent upon great excitement. When these feelings are very remarkable on the invasion of acute maladies, they augur a very dangerous attack; and when they become extreme at a far advanced period they are then attended by great danger, and they require the administration of very active restoratives, appropriately to the circumstances of the case. (See Arts. Debility and Disease (§ 67.).

88. C. Pain is a most important symptom, as indicating the seat, the nature, and even the probable result, of disease. It is a warning furnished by nature to convey this information; it both puts the patient on his guard to remove the cause of suffering, and disposes him to use the means for this purpose. It further tends to rouse the conservative influence of life — to excite the vital resistance — against the extension of disease,

to prevent dangerous or fatal sinking, and to bring about a salutary reaction. In order, however, that pain should have these salutary effects, it should not be allowed to be excessive or intense for a prolonged period, or without having recourse to means to assuage it; the expression of it, when excessive, ought not to be suppressed; and the effect of its continuance, as well as the several phenomena which accompany it, should be closely observed and carefully compared and estimated. In our investigations into the nature and seat of pain, there are several things to be ascertained, especially its *duration* and mode of *accession*, its exact *seat* and *relations*, its *character* and *severity*, and the influence produced upon it by different degrees of *pressure*, *percussion* and *temperature*.

89. *a. Pain* may be either *dull*, *obtuse*, or *heavy*, or *aching*, in connection with congestions and chronic inflammations, or with acute or chronic inflammations of parenchymatous organs, and mucous membranes, in cases of effusion into internal cavities, or of internal tumour, and sometimes in the congestions and vascular determinations preceding hæmorrhages.

90. *b.* A *gnawing* or *lacerating pain* generally accompanies rheumatism, gout, cancerous disease, &c. A *perforating* or *boring pain* is felt chiefly in diseases of the periosteum and bones, in secondary or tertiary syphilis, in scurvy, especially at night, in the long bones and joints. A *burning pain* attends gout, severe or intense inflammation of the integuments, erysipelas, carbuncles. A *pungent* or *tensive pain*, often with more or less of a sensation of burning, is experienced in acute inflammations of serous membranes; and in its most violent or stabbing form, in inflammation of fibrous, or sero-fibrous tissues, and in those affections of the nerves, which have usually been termed neuralgic, and which proceed either from inflammation of the sheath or neurilemma, or from irritation at or near the origin of the nerve. This kind of pain, also, especially when occurring at short intervals, and of brief duration, and characterised by violent dartings, accompanies the passing of gall stones, or of calculi along the ureters. A *cutting* or *darting pain* also attends cancer, and inflammation of nerves, in which latter it is often accompanied with a sense of numbness in the parts distant from the seat of pain, and is often, in this as well as in the other maladies just mentioned, characterised by a feeling of heat or burning.

91. *c.* A *pulsating pain* indicates extreme congestion of a parenchymatous organ, or the passage of inflammation into suppuration — commonly this latter when it is attended by horripilations, chills, or rigors (§§ 19.). When this pain is preceded by a feeling of tension, the existence of abscess, or of effusion into a shut cavity may be inferred. A *pricking*, *stinging*, or *tickling pain*, may accompany acute eruptions on the skin, gout, organic diseases of the brain, spinal chord, or their membranes, especially when these pains are felt in the extremities, and are attended, or are interrupted, by a feeling of numbness (§§ 41.), also hysteria, and hypochondriasis. A *violent twisting*, *spasmodic*, or *griping pain* accompanies dysentery, ileus, gastralgia, enteralgia, strangulated hernia, and obstructions in the bowels. A *forcing*, *acute pain* often also attends these maladies, the passage of concretions along canals, and diseases of the uterus and ovaria.

92. *d. The seat and duration of pain* suggest interesting considerations. The *seat*, however, should not always be received as a correct indication of the seat or origin of the disease: for, even in inflammations, the pain may be referred to parts at a distance from the seat of disease: thus, in pleuritis, the pain may be felt in the iliac regions, or below the false ribs; and, when a limited portion of the spinal chord or membranes is influenced, the pain may be referred to the distant extremities of nerves having relations with the seat of disease. This topic, is however, more fully illustrated in the article Sympathy.

93. The *duration* or continuance of pain is most various. It may be *transient*, *wandering*, *intermittent*, *remittent*, or *permanent*. *Transient pains* occur in hysteria, in gout, rheumatism, hypochondriasis, in catarrhal fevers and influenza, from irritation of the digestive organs, from accumulations of bile in the ducts or gall-bladder, and from irritation of the nervous centres of animal life. *Intermittence* or *remittence* of pain shows its seat in the nervous system, especially of animal life, and occurs chiefly in those diseases, in which this system in some part of its ramifications is more or less implicated, as in neuralgia, periodic fevers, rheumatism, gout, hysteria, &c. *Continued* or fixed pain indicates the more or less permanent nature of the malady, as inflammation, disorganization, rheumatism, syphilis. *Wandering pains* occur during the accession of acute or febrile diseases, in hysteria, hypochondriasis, syphilis, rheumatism, atonic gout, and in functional disorders of the digestive organs, especially he liver and stomach.

94. *e. Pressure* and *percussion* produce certain effects on pain which are extremely important in diagnosis. *Tenderness*, or incapability of enduring pressure, or increase of pain on pressure, is a sign of inflammation or of organic change. But in nervous, hysterical and hypochondriacal persons, the tenderness may not be connected with increase of pain on pressure — may be merely a morbid, superficial sensation, or an intolerance of touch; for, when pressure is made, when the patient's attention is distracted, or firmly or forcibly, the pain is either not increased or is diminished, showing the true nervous character of the tenderness or pain in these. *Diminution* of pain on pressure characterises colic, chronic rheumatism, and nervous pains or pure neuralgia, when not occasioned by inflammation of the nerve or its sheath. *Increased pain* on pressure attends inflammation, organic changes, the results of, or the attendants of inflammation, and vascular congestion. Increased or continued pain, the skin being hot or dry, and the pulse hard, or rapid, is a sign of progressive inflammatory action; and if the pain become pulsating with chills, heats and sweats; the sweats not diminishing the pain or changing its pulsating character, suppuration may be inferred. *Prolonged pain*, with more or less tenderness on pressure, indicates organic change, especially if emaciation advances, and if the secretions or excretions be disordered. A *decrease* of pain after the secretions and excretions become free or augmented is always a favourable sign. A *cessation* of pain coinciding with remission of fever and increase of the natural discharges

is also a favourable symptom ; but a sudden cessation, without abatement of the other symptoms, or with the appearance of others which are unfavourable, indicates the occurrence of gangrene, or of rapid vital sinking. *Pain* or *spasm*, or the association of both, in parts which are paralysed either as to motion or sensation, is an indication of inflammatory action, or of inflammatory softening in or near those parts of the nervous centres, with which the nerves of the affected parts have intimate relations. Severe pains or spasms in a different extremity or part from that which is paralysed, indicate the presence or extension of inflammatory action to those parts of the nervous centres connected with the origins of the nerves of the pained extremity. (See Arts. HEADACHE, IRRITATION, NEURALGIA, PARALYSIS, SPASM, &c.)

95. ix. THE MENTAL MANIFESTATIONS furnish numerous signs, in respect both of their individual conditions and morbid associations, and of their connections with acute and chronic physical disease. But these have been noticed. as far as my limits admit, when treating of DELIRIUM, COMA, SLEEPING and SLEEPLESSNESS, and of the different grades and forms of INSANITY, in which latter especially, as well as in the other articles, I believe these subjects have been fully discussed.

96. III. THE SYMPTOMS AND SIGNS OF THE DIGESTIVE FUNCTIONS AND ORGANS.—These functions and organs are essentially vital, and are under the dominion of the organic nervous system — the primary or chief factor of life — excepting at the entrance to, and outlet from these organs; and to these situations, accessory influences are imparted from the cerebro-spinal or animal nervous system. The states and disorders of these functions and organs, from the entrance to them by the mouth to the outlet by the anus, are intimately connected with the conditions of the organic nervous system ; whilst this entrance and this outlet are controlled by the cerebro-spinal nervous influence. Thus the functions of the several digestive organs are manifestations of the conditions of organic nervous power, and the functions of these portals are indications of states of cerebro-spinal influence. The symptoms and signs furnished by the digestive functions and organs, comprise those evinced by the *teeth* and *gums*, by the *tongue* and *throat*, by *deglutition*, by the *appetite for food* or *drink* ; by the functions of *digestion*, by *fæcation* and *defæcation*, and by the *abdominal regions*.

97. *A.* THE MOUTH *&c.*—(*a*). *The Teeth* are perfect and enduring in persons of sound constitution, their soundness often continuing to advanced age. Their early decay indicates either constitutional vice, or impaired constitutional power, or prolonged disorder of the digestive functions. The teeth are variously affected by acute and chronic maladies.—*Chattering* of the teeth occurs in the cold stage of fevers and invasion of acute diseases, and indicates a severe form of the supervening malady. It is also observed in hysteria, but in rare instances ; and in dangerous shocks of the nervous system. It is most remarkable in the cold stage of agues. *Grinding* of the teeth during sleep, is common in children, and is a sign either of intestinal worms or of cerebral disease. If it occur in children in connection with brightness of the eyes, contracted pupils, flushing of the cheeks, or startings in sleep, then convulsions, cerebral meningitis, scrofulous softening of the brain, or other changes may be apprehended. In aged persons it sometimes precedes an attack of apoplexy or palsy. If it occur in continued or in exanthematous fevers, it renders the prognosis more unfavourable, as evincing a serious cerebral complication. It may, however, take place in irritable persons and children, without any serious disorder, especially during dentition in children.

98. The teeth are often covered with a greyish mucus in catarrhal fevers, in gastric disorders, and in inflammations of the digestive and respiratory organs. They are more copiously covered by mucus or sordes of a dark or brown colour, often extending to the lips and gums, in low, adynamic, or putro-adynamic fevers; the quantity and darkness of the colour evincing the amount of danger. The accumulation of tartar or cretaceous matter around the teeth, at the margins of the gums, shows a disposition to calculous, gravelly, or gouty affections.

99. The teeth sometimes become inordinately sensitive in nervous disorders, in disorders of the digestive organs, and in acidity of the stomach. They are loose in scurvy, in purpura, and in mercurial salivation. They appear elongated, owing to retraction of the gums, in scurvy, sometimes in scrofula, and often in chronic gastritis and other prolonged disorders of the digestive organs. They become carious owing to the excessive use of saccharine and acid substances, especially in early life, to the abuse of mercury, to chronic indigestion, and to ricketty and scrofulous habits of body. Improper diet, at an early age, favours the occurrence of this change in the teeth ; diseased teeth are always an indication of pre-existing disorder of the digestive organs, often connected with the abuse of spirituous liquors, or of sugar in its various uses; and they generally evince impaired vital power and resistance.

100. (*b.*) *The Gums* and lips are pale in anæmia and chlorosis, and after excessive hæmorrhage, or injudicious bloodletting. When they are covered by a similar mucus to that observed on the teeth (§ 98.), the diagnosis and prognosis are as above stated. They present a blue margin in cases of slow poisoning or contamination by the preparations of lead ; and a red, spongy and swollen appearance from the use of mercury, from prolonged disorder of the digestive organs, in diabetes, in incipient scurvy, and in purpura. They become of a darker hue, more spongy, more retracted, and more disposed to bleed in scurvy and in chronic stomatitis. They are still more seriously affected in the ulcerative, gangrenous, and phagedenic forms of this malady. (See Art. STOMATITIS.)

101. *B.* THE TONGUE presents diversified appearances depending — 1st. Upon the states of the several digestive functions ; — 2d. Upon the nature of the disease ; and 3d. Upon the existing constitutional disturbance, chiefly as respects organic nervous power, vascular action, and sanguineous contamination. In estimating the signs furnished by the tongue it should not be overlooked, that it may be coloured by medicines, by food and by drink, and be rendered drier than natural by breathing through the mouth ; but it

is much less disposed to be affected by these causes in health than in disease.

102. *a. The mode of protruding*, of holding out, and of withdrawing, the tongue is always deserving attention. The tongue is protruded with difficulty in comatose, apoplectic and paralytic cases, owing chiefly to a weakened or paralysed state of the organ; and, in the more dangerous states of these diseases, it is either imperfectly protruded or not at all. In this latter case, either the existing insensibility prevents any attempt to execute the command, or the muscular power is so paralysed as to prevent the act of volition from being performed; and if it be executed, the tongue often remains protruded. A slow or tremulous protrusion; or tremor during the protrusion, of the tongue, is observed in many nervous complaints attended by debility or exhaustion, and more especially in low, typhoid or adynamic fevers. A ready, quick and steady protrusion and withdrawal of the tongue occur in diseases of excitement, in inflammatory affections, and whenever organic nervous power is not materially depressed, or when the cerebro-spinal influence is not impaired or suppressed, as in the stupor or sopor of low fever, or in comatose states. As long as the perceptive faculty is unimpaired and muscular power is not remarkably reduced or paralysed, these acts are usually naturally performed. The tongue is protruded to one side in cases of paralysis, especially in hemiplegia; but there is no certain correspondence between the side to which it is protruded and the affected side.

103. *b. The size* of the tongue varies in different diseases, and with variation in size there is often also variation in *form*. *Increased size* is caused by inflammatory action chiefly, this action being either *primary* (See Tongue, *inflammation of*) or *consecutive*. It is the latter chiefly as a complication of angina, of scarlet fever, small-pox, of hysteria, epilepsy, syphilis, and as a consequence of mercurial action, or of poisons. The enlargement may, instead of being acute as in these cases, be chronic and the result of an hypertrophy or increased irritation of its tissues. With the enlargement may be connected several other appearances, which indicate prolonged chronic or visceral disease, as well as impaired constitutional or organic nervous power. The chief of these are—1st. A broad, flabby state, with more or less intumescence, and with indentations by the teeth on the edges of the tongue;—2d. A fissured or sulcated condition, the tongue appearing lobulated as well as enlarged; and 3d. A tumid and livid state, the surface being covered by a yellowish load, or a milk or cream-like mucus. The first and second of these occur chiefly in prolonged disorder of the digestive organs, or as consequences of mercurial action, or in connection with hepatic disease, &c.; the third more frequently as a result of diseases of the lungs, heart, and urinary and uterine organs. Swelling of the tongue is a dangerous sign in cerebral affections, and in cases of poisoning. It is also very unfavourable in exanthematous or continued fevers, especially the putro-adynamic and pestilential, and in scurvy, particularly when the swelling is great, or when the tongue is dark or livid, or is covered by a sanguineous or sanious exudation.

104. *c. Diminution* of the size of the tongue is usually much less remarkable than enlargement. The diminution may be more apparent than real, owing to contraction of the organ laterally, as well as to a partial retraction. In these cases the tongue is narrow and pointed, and indicates a most dangerous state of typhus, typhoid and adynamic fevers, of acute irritation or inflammation of the digestive organs, or of the brain or membranes, especially when it is also dry and red at the point and edges. Actual diminution of the size of the tongue is comparatively rare, as emaciation, even when extreme, affects but little this organ.

105. *d. The form* of the tongue is not materially different from that already stated — the chief modifications being in the breadth of the organ in relation to the length, in the narrowness and thickness of it, and in the fissured or lobulated appearance of its upper surface. But this surface may present other conditions. It may be so deeply indented or furrowed, or fissured, along the centre, from the root to nearly the point, as to appear almost divided into two halves, the sides of this indentation sometimes being more or less furred (§ 110.). This state occurs chiefly in chronic disease of the abdominal viscera, especially of the digestive organs, and indicates a most obstinate, although not a dangerous disease. The tongue when protruded may present either a convex or a concave appearance of its superior surface, or a double convexity, owing to the furrow along the centre. When either of these states is very remarkable then more or less irritation or inflammatory action of the abdominal organs is very frequently present. The lobulated state of the upper surface of the tongue is caused by more or less numerous fissures or indentations in various directions. It is generally connected with a tumid and convex condition of this surface, and is most frequently seen in chronic diseases of the liver or other digestive organs, in diseases of the heart, and in disorders of the female sexual organs.

106. *e. The humidity* of the tongue proceeds from the salivary secretion poured into the mouth, and very partially from the mucous secretions in the vicinity, and from the exhalations taking place in the surface of this part and the vicinity. The presence or absence of this humidity — the moisture or dryness of the tongue, is most important as respects the other states of this organ, and as regards the secretions and excretions, and the conditions of vital power, and of the circulating fluids. *Humidity* of the tongue is often very remarkable in cases of debility when all the secretions are free, and the blood uncontaminated. When it is very considerable, and is attended by *softness* of the organ, and by a flattened state of the fur, when fur has been present, as in convalescence from acute diseases, either tonics are required or lowering means should be avoided. When the tongue has been dry or furred, or both, then returning humidity and softness are always excellent signs, and especially when the surface becomes also more clean, or when the fur disappears or is flattened, the tongue and mouth being sufficiently moist, &c. In acute diseases, the humidity appears first at the sides of the tongue, and gradually extends, the other changes advancing with the increase of humidity, and being favoured by the state of the salivary secretion. As long as the tongue and mouth continue moist, in acute

maladies, a favourable opinion as to the issue may be entertained.

107. *f. Dryness* of the tongue is as unfavourable a sign as humidity is favourable. Dryness, however, may be occasioned by breathing through the mouth; but this will seldom produce it in a very marked degree, if febrile, or inflammatory action be not present. Dryness is most common in continued fevers, in the exanthemata, in inflammation of the abdominal viscera and of serous membranes, and in various other diseases of an acute and febrile nature. It is most remarkable, and presents either roughness, owing to the parched state of the papillæ, or fur, or a fissured or burnt appearance, often with a deeper or darker hue, in the most dangerous states of these maladies. The more extreme of these conditions of the tongue, and especially when they are not attended by thirst, are generally fatal indications. When the tongue has been furred and loaded, and subsequently becomes dry, rough or hard, and at the same time very dark, the furred surface being both dry and dark, or even black, a malignant or almost hopeless state may be inferred, owing chiefly to exhaustion of vital power and contamination of the circulating fluids, with arrest of the secretions. Humidity of the tongue rarely supervenes upon this extreme state, unless this dark appearance has been heightened by the substances taken into the mouth; but, in the less remarkable cases, the occurrence of humidity often takes place, and is a most favourable sign, inasmuch as it shows a return of the salivary secretion and of the secreting functions generally, especially when the skin also becomes less hot and dry, or more natural or perspirable.

108. *g. The colour* of the tongue should always be observed. The *natural* hue is favourable, and a return to it is an indication of a favourable crisis or change. The tongue may be more or less *pale*, and the pallor is commonly associated with a similar hue of the gums and lips, in cases of anæmia, of chlorosis, after large blood-lettings or hæmorrhages, and during prolonged chronic diseases, and affections of the spleen, owing either to a deficiency or to a poorness of blood. A very *red* tongue occurs chiefly in inflammations of the throat and pharynx, and in the exanthemata. A limitation of the redness to the point and edges is very general in acute irritation or inflammation of the digestive mucous surface, in gastric and bilious fevers, and in remittent and continued fevers, but in those latter, the surface and base of the tongue is at the same time loaded, coated or furred. If the tongue, after having been coated or furred, becomes *very red and clean*, in gastric fevers, and inflammatory or other acute diseases of the digestive or abdominal viscera, without returning strength or other favourable symptoms, a dangerous prognosis may be inferred; and more especially if the febrile symptoms be not abated, if the tongue be dry, and if the redness assume a glossy or varnished appearance. If, with this change, the tongue presents a yellowish red hue, and becomes glossy, dry and clean, great danger should be anticipated, especially in severe remittents, in bilious fevers, in putro-remittent or adynamic fevers, and in acute diseases of the liver and digestive canal. If the redness pass into a *brown, livid*, or *bluish* or deep *leaden hue*, whether the surface of the tongue be also moist or dry, or soft or hard, or furred or coated, or rough, or smooth and glossy, &c., an imperfectly changed, an insufficiently oxygenated, or a contaminated state of the blood may be inferred. This appearance, thus variously associated, according to the nature and stage of the malady, is observed in the most dangerous cases of asthenic or congestive pneumonia and bronchitis, especially when both lungs are affected, in organic diseases of the heart, in asthma, hydrothorax, in dangerous cases of hooping-cough, in the malignant or putro-adynamic, or asthenic forms of exanthematous and continued fevers, in pestilential maladies, in scurvy, and in the last stages of other diseases, or shortly before dissolution.

109. *h.* A *white* tongue is common in catarrhal and febrile disorders, in functional disturbances of the digestive and respiratory organs, and in the premonitory and invading stages of fevers — periodic, exanthematous, and continued — and of inflammations. A *clammy* state of the tongue, with a whitish, or yellowish-white, or milky load on the surface and base, with more or less humidity, is frequently seen in visceral diseases, in inflammatory affections of mucous surfaces, in the early stages of fevers, in connection with redness of the point and edges, and in puerperal fevers accompanied with a flabby and lurid appearance of the organ. A *loaded* tongue, the load varying in quantity, colour and consistence, occurs in bilious diseases, in the early stages of periodic and continued fevers, and in most of the maladies in which a clammy state is observed. These states, especially a loaded condition, are frequently complained of in the morning, soon after waking, by persons who are dyspeptic, or whose digestive organs, — stomach, liver or bowels, — have been much disordered; or who have been in the habit of taking suppers, or of smoking, or of drinking malt or other liquors previously to retiring to bed.

110. *i. A furred* tongue is always a serious indication. The fur resembles the pile on the surface of cotton velvets; and varies in length and thickness. It is often covered by a clammy or dirty mucus, the tongue being also coated on the surface and base by a load of fur and mucus. The colour of the fur varies from a greyish white to a brown or black, the surface generally becoming thus coated and dry or parched before the darker hues are observed. The origin of the fur has not been satisfactorily explained; but it may be attributed to a morbid development of the filiform papillæ of the tongue which become elongated during the progress of disease, and covered by the inspissated and dark mucus, which generally collects in the mouth during the diseases in which the tongue is furred. The surface of the fur, especially when thus coated, presents a more or less dark brown, or black hue, according to the duration, severity and danger of the disease, the deepness of the hue, however, being often much increased by the colouring properties of the substances taken into the mouth.

111. A furred state of the tongue is common in inflammations, especially of parenchymatous organs; in severe irritation of mucous surfaces and canals; in continued, exanthematous, typhoid or adynamic fevers; in diseases of the brain or of its membranes, and in most other acute maladies which advance to a dangerous condition. In the early stages of inflammations and continued

fevers, the filiform papillæ are merely erect and somewhat developed in length, giving the tongue a whitish hue. In the early stages of the exanthemata, especially in scarlatina, the fungiform papillæ on the sides, point, and middle, are very much enlarged, and appear very manifestly dispersed through the fur produced by the filiform papillæ. This appearance is also observed in many of the diseases of children, more particularly in those of the digestive organs. The dirty or clammy mucus, so frequently accompanying a furred tongue, loads the papillæ; and, with the progress of these maladies, especially as they proceed to an unfavourable or dangerous state, forms a darker or deeper coat, which often covers the whole upper surface of the organ, either in a continuous crust, or with more or less slight fissures in various directions.

112. The depth of colour, the dryness, the contraction or diminution of the surface of this fur and coating, and of the tongue itself, are important circumstances, and require close attention in the progress of acute diseases. An increase of either, and especially of all, of these indicates a proportionate increase of danger; whereas a diminution of these appearances, evinces a favourable issue, more particularly if the tongue becomes more moist and more clean, the fur and load disappearing from the point and sides, and progressively from the surface and base, the colour of the organ becoming at the same time more natural. If the coat or crust formed on the tongue be rapidly removed the surface thereby exposed being glossy, smooth, or fissured, and dark-coloured, or having a raw appearance, the prognosis is not improved by the occurrence. This change often proceeds from self-contamination of the blood in the course of the disease; the tongue frequently becoming still more dark, contracted, dry and even hard, towards a fatal issue.

113. With slight development of the filiform papillæ, the tongue sometimes presents *patches* which appear partially deprived either of papillæ, or of the epithelium covering the upper surface, which, at the same time, is broad or flabby, the edges of the tongue being occasionally also indented by the teeth. This appearance is observed chiefly in protracted disorders of the digestive organs, and in hypochondriasis, hysteria, and diseases of the uterine organs. It is always an indication of protracted and intractable disorder.

114. *k. An aphthous state* of the tongue, affecting chiefly the point and edges, is often observed in the last or fatal stage of tubercular consumption, and of several other visceral diseases. It is always a serious indication in the diseases of adults, even when unconnected with phthisis, especially in diseases of the digestive and urinary organs. (See Arts. STOMATITIS, THRUSH, and TONGUE, *diseases of*.)

115. *l. The temperature* of the tongue is seldom materially affected. It is somewhat *increased* in inflammatory fevers, and in the early stages of exanthematous and continued fevers. It is diminished in all diseases, or towards the fatal issue of all maladies, in which the tongue presents a livid or dark hue. It is most diminished, becoming cool or cold, as pestilential cholera proceeds to a fatal termination.

116. C. THE SALIVARY SECRETION is intimately connected with the state of the tongue and mouth in disease, and with the indications furnished by the latter.—*a. Diminution* of the secretion both of saliva and mucus occurs at the commencement, and during the greater part of the progress of febrile and acute diseases; and with this diminution, which often amounts almost to suppression, these secretions become thick, viscid, or clammy, especially in continued, exanthematous, and low fevers, and in affections of the brain. They often assume a dark or dirty hue, thereby loading the tongue, and often collecting about the teeth, gums and lips. The bloody or sanious appearance of the interior of the mouth observed in scurvy and hæmagastric pestilence, is not produced by the saliva and mucus, but by the admixture with these of the semi-dissolved blood, exuded from the surfaces of the tongue and gums. A return of the salivary and mucous secretions, after their diminution or suppression, is always a very favourable sign, the detachment of the fur and load on the tongue during incipient convalescence being thereby favoured.

117. *b. Increased* salivary secretion — *ptyalism* — may be produced by any stimulus taken, or retained for a time in the mouth. It accompanies various affections of the gums and mouth, and the natural processes of teething in childhood. Whilst it is a salutary indication of teething, the sudden interruption or suppression of it is a very serious occurrence, and is very often a sign of incipient or advanced disease of the brain or its membranes. Ptyalism is produced by the constitutional or local operation of mercurials, iodine and iodides, and various other metallic and poisonous substances. (See Art. POISONS, *pluries*.) It attends, as a contingent, or intercurrent phenomenon, several diseases, as gastric catarrhs, chronic dyspepsia, hypochondriasis, hysteria, diseases of the pancreas, and occasionally small-pox. In the confluent form of this last malady, it is often a favourable symptom; but if it cease suddenly or prematurely it is generally a fatal indication.

118. *D.* The THROAT *and fauces* present signs of disease not merely of the digestive canal, but also of the constitution. — *a. Relaxation* of the *uvula* is a symptom of general debility, in connection either with disorder of the stomach, or with catarrh, or with gastric catarrh or that state of catarrhal irritation of the digestive and respiratory mucous surfaces which often appears in spring and autumn, in connection with or even constituting catarrhal fevers. The elongation of the uvula, the result of relaxation, is often a cause of irritation to the epiglottis, and occasions or aggravates cough. And this having been admitted, to more than its full extent, it became a fashion to extirpate the uvula, without any regard to its functions, and without reference to the fact that the want of an uvula may be quite as injurious as an excess of it.

119. *b.* The *tonsils* or amygdalæ are often enlarged, either by acute disease — *tonsillitis* — or by a chronic congestion. Sometimes they are enlarged in connection with elongation of the uvula, and redness or chronic inflammation or irritation of the fauces, and pharynx. Chronic enlargement of the tonsils is not so frequently a sign of disorder of the digestive organs, as of a scrofulous diathesis, or of general derangement of health. In connection with redness of the fauces, palate, and pharynx, enlargement or redness of

the tonsils, is an indication of disorder or disease of the digestive organs, of exanthematous and gastric or bilious fevers, and often also of continued and typhoid fevers. This redness of the several parts of the throat, with redness of the point and edges of the tongue, and development of the fungiform papillæ, is very remarkable in the early periods of scarlatina, and frequently also of measles and small-pox. (See also Arts. Throat and Tonsils.)

120. *c. The secretions* of the throat are often materially affected. With increased redness they may be either diminished or augmented. *Dryness* of the throat attends the commencement or early stage of inflammation of the parts just mentioned (§ 119.). And, in cases where an injudicious and officious treatment has removed either the uvula, or the tonsils; dryness of the throat, and roughness or change of voice, have rewarded the confiding or credulous patient; the parts concerned in secreting, and in distributing, a lubricating mucus to the surface of the throat having been extirpated, as if nature had formed them for no purpose. During the more advanced stages of inflammatory irritation, the mucous secretion and watery exhalation from the throat are much *increased*; the same effect follows catarrh, catarrhal fevers and influenza; in which, as well as contingently on several diseases, increased secretion and exhalation are prominent affections.

121. E. Deglutition is often affected owing to disease either of the passages—of the throat, pharynx and œsophagus — which convey substances into the stomach; or of the brain, or of the structures surrounding and protecting it, especially the base of the brain and medulla oblongata. The diseases of the passages leading to the stomach, and the attending symptoms of difficult and interrupted deglutition, are considered in the articles Œsophagus, Throat, and Tonsils. *Dysphagia*, or difficult deglutition, and *Aphagia*, or impossibility of swallowing, are caused not only by lesions of these parts, but also by diseases of the brain or medulla oblongata, or of their envelopes, and by structural changes implicating the nerves supplying the tongue, pharynx and upper portion of the œsophagus. When swallowing is materially affected by these latter pathological conditions, then speech and voice are generally more or less disordered, or both deglutition and speech may be altogether lost. I saw a gentleman who had lost the faculties of deglutition, speech and voice. He complained of no other symptoms referrible to the head or cervical region; and was otherwise in good health. Deglutition partially returned after a time, but the power of articulation was never restored. He died suddenly. The body was not allowed to be inspected. Impaired or lost power of swallowing, with or without loss of speech but most commonly with partial or complete loss of this faculty, may either be the precursors of a more general attack of palsy or of apoplexy, or be the consequences of an attack of either or of both. But whether ushering in, or following a cerebral attack, it is always a most dangerous symptom. When a fatal issue does not supervene, the power of swallowing generally returns, either partially or altogether, before speech or articulation is restored.

122. In all these cases deglutition is impaired or lost owing to paralysis of the muscles concerned in this function, but it may be difficult, painful, impaired or impossible, in consequence of spasm of these muscles, or of some portion of the œsophagus, as in rabies canina or hydrophobia, and in hysteria, hypochondriasis, &c., in all which the difficulty of swallowing liquids is greater than that of taking more consistent substances. The dysphagia accompanying hysteria and other functional nervous affections is not further unfavourable, than that it indicates a greater severity of these affections. The aphagia of rabies is always a fatal sign, although it generally disappears before dissolution. Painful, difficult or impaired deglutition is often a symptom of the presence of flatus in the œsophagus, and in these cases, spasm of portions of the œsophagus often takes place. When swallowing is affected by this cause, flatulent eructations either precede, accompany, or follow the act; and the patient is generally subject to one or other of the forms of *indigestion*, or to *flatulence* during empty states of the stomach.

123. ii. The Appetites for Drink and Food are generally affected by disease.—*A. a. The desire for drink* is *diminished* in several diseases, and is in most of these a very unfavourable symptom, more especially when the tongue and mouth are dry, and other febrile symptoms are severe. In the advanced stages of fever, especially in continued and typhoid fevers, and in the advanced periods of inflammations, particularly of the brain or of its membranes, the absence of thirst or of a desire for fluids or drinks of any kind is a most dangerous, although not necessarily a fatal sign, especially in fever. In chronic diseases, the absence of a desire of drink is often present, and is merely an indication of the absence of febrile excitement; but, in the last stages of acute diseases and fevers, it shows the existence of a state of sensibility which is either associated with delirium, or about to pass into it, or into unconsciousness or coma.

124. *b. Increased desire* of drinks is generally present in all diseases caused by irritation or inflammation—in febrile maladies during the earlier stages, and before sensibility or consciousness becomes impaired. The supervention of thirst or an increase of it, in the course of chronic disease, is an indication of intercurrent irritation or inflammatory action. Its continuance after critical evacuations is an unfavourable circumstance. Thirst, in its extreme state, is present in the most dangerous cases of choleric pestilence, and in inflammations of the stomach, &c. Thirst, with an inability of drinking, is characteristic of rabies; and sometimes occurs in hysteria, hypochondriasis, but in a much less marked, and in a different form. The sudden cessation of thirst, or absence of the desire of drink, after thirst had been urgent, precedes unconsciousness or coma.

125. *c.* An appetite for *certain kinds of drink*, in preference to others, is observed in several maladies, — for iced water, or cold water, or for ice, in the stages of vascular excitement in fevers, inflammations, &c., especially in choleric pestilence and inflammations of the digestive canal; — for demulcent and emollient drinks, in affections of the respiratory organs; — for acid or acetous fluids, in chlorosis and disorders of the female sexual organs; — for vinous and restorative drinks in diseases of debility, in nervous disorders, and during convalescence from fevers. The appetite for these several kinds of drink, is an indication of

the nature of the malady, and is, in many cases, in accordance with the intentions of cure which should be adopted. The desire for intoxicating drinks is of itself a malady, which, when not gratified, is attended by distressing symptoms of exhaustion and nervousness.

126. *B. Desire of food* when moderate or natural is a favourable symptom in chronic affections.—*a. A diminution* or entire *loss* of this desire is present in most acute, and in many chronic diseases. With increased desire of drink diminished or lost desire for food is evinced. *Anorexia*, or loss of appetite, is often an indication of the impropriety of taking food, inasmuch as it occurs either in fevers, or in inflammations, or in other diseases of the stomach and digestive organs, in all which food would either be thrown off, or nôt digested, or be a cause of increased disorder. A diminution merely of the appetite is often caused by want of exercise, especially in the open air, and in aged or paralysed persons, for whom the demands of nutrition are neither great nor urgent. It is also observed in chronic affections, often, however, with a return of the desire, or with cravings after intervals. The loss of appetite is always complete at the commencement and early stages of fevers and acute diseases. If it continue during convalescence, a relapse, or some important sequela, or structural change, should be inferred.

127. *b. Increased appetite* is, in its various degrees, not only a symptom of disease, but often also a sign of approaching disease. Extremely increased appetite — *Bulimia* — *fames canina* — has been treated of in the article APPETITE. These states, only, of increase which are observed as a symptom of disease will be noticed at this place. Increased appetite is most frequently a consequence,—1st. of an increased demand for support and nutrition, as occurs during pregnancy, and in convalescence from acute or exhausting maladies, — 2d., or of a state of erythism, or irritation of the stomach and digestive organs, — 3d., or of irritation or disease of the nervous centres of animal life. Increased appetite in the early stages of fever, or of other acute diseases, is unfavourable, but if it occur in connection with other signs of improvement it is a favourable indication. If it be present without other signs of improvement, after anorexia has existed, a dangerous sequela is indicated. Increased appetite is frequent in all verminous diseases, owing to the irritation they produce, and the consumption of nutritious elements; and it is often caused by the use of stimulants — of wine, spices, hot sauces, &c. A great increase of appetite — or a keen, or ravenous, or craving appetite — often ushers in, or precedes for a short period, an attack of apoplexy, or of epilepsy, or palsy, or mania or phrenitis. Increased appetite very generally attends epilepsy in the intervals between the fits, and is the greatest before a severe paroxysm. It often also accompanies hemiplegia, and it indicates either an attack of apoplexy, or an exasperation of the paralytic seizure, at no very distant period. A craving for particular kinds or articles of food is observed in the course of both acute and chronic diseases, and is often suggested to the imagination of the patient by recollections of the past, or by the attendants; but whether these cravings convey a favourable or unfavourable import depends upon the effects they produce when the patient is allowed food. A craving for unnatural or improper kinds of food — *Pica* — or for articles that are not commonly used for food, sometimes occurs during pregnancy, in chlorosis, and in the course of several disorders of the female sexual organs. (See Art. APPETITE, VITIATED.)

128. If increased appetite become changed to loss of appetite, or to loathing of food upon taking a small portion only, chronic gastritis or structural change in the stomach may be inferred. A desire for animal food early in febrile diseases, or previously to convalescence, is an unfavourable sign. A keen appetite is generally produced by exercise in the open air; but it is also often the result of habit, and of want of occupation either mental or physical, especially when indulged. Excessive use of animal food is often progressive, the uses of certain kinds creating an increased desire for them, especially of pork. Persons who have thus indulged their appetite generally die prematurely, or seldom live beyond middle age, and are either carried off by apoplexy, by a mixed epileptic and apoplectic seizure, or become hemiplegic. If attacked by continued fever, or by small-pox or scarlet fever, they seldom recover, the malady assuming either a comatose, or a putro-adynamic form.

129. *c. Loathing of food*, and *nausea* excited by certain kinds of food, are generally observed in the premonitory period of fevers and acute diseases, also in affections of the stomach. A dislike of flesh meats is very remarkable in these cases. A loathing of certain kinds of food is frequent in delicate, nervous, hysterical, and hypochondriacal persons. When it depends upon disorder of the digestive organs, nausea, horripilations, and even vomitings or retchings, often supervene. Prolonged loathing of food in chronic diseases augurs the presence of organic lesions. The occurrence of loathing in convalescence indicates either a relapse or the supervention of visceral change.

130. *d. Nausea* may proceed either from the state of the digestive organs, especially of the stomach, or from the nervous systems of organic and animal life. The digestive organs sympathise, through the medium chiefly of the organic nerves, with all the other abdominal and pelvic viscera, the stomach evincing this sympathy more particularly by nausea, or vomiting. The nausea sometimes observed in hysteria, in pregnancy, and in hypochondriasis, is generally also sympathetic of irritation transmitted through the medium of the ganglial nerves to the stomach. Nausea on the invasion, or at an early stage, of continued and exanthematous fevers is only an indication of the marked participation in the disorder of the whole œconomy, which the stomach generally evinces. Nausea, often attended by vomiting, accompanies epileptic seizures and diseases of the brain; and in these it is always a very serious or even a most dangerous symptom. Nausea may be produced by a disgusting sight, or even by the recollection of such; and, in these cases, the impression is conveyed from the brain, as in cases of organic lesions of the brain, by the communicating nerves to the organic nerves or ganglia supplying the stomach. The nausea and sickness produced by sea-voyages have been attributed to affection of the brain sympathetically conveyed to the stomach, but they appear to be more directly owing to an affection of the semilunar and other ganglia,

than to the state of the brain, which seldom betrays much disorder in cases of sea-sickness. Vomiting consequent upon fæcal obstruction is a most dangerous symptom, and is always fatal when the vomited matters have a fæcal odour. (See Art. Vomiting.)

131. *e. Various other symptomatic affections* of the stomach occur and furnish important information as to the nature, seat, and issue of disease. These affections are eructations, heart-burning, retchings and rumination, and are described, with their various relations, in the articles Flatulence, Indigestion, Pyrosis, Rumination, and Vomiting. To these I must refer the reader; and only adduce at this place a few remarks respecting flatulent and other eructations as a symptom of disease. *Eructations* either are flatulent, or consist of fluids, or of semi-digested articles, which may be sour or acid, or saltish, or alkaline, but very rarely the latter. Flatulent eructations occur not only in most affections of the stomach, but also in congestions and torpor of the liver, and in obstructions to the functions of this organ. They frequently depend upon a gouty diathesis, and attend, but more generally precede, an attack of this disease. They are common also in hysteria and hypochondriasis; the flatulence often rising in the œsophagus, and remaining for a time confined there by spasm, increasing disorder by pressing upon the heart and large vessels. Even when flatulence and flatulent eructations depend upon the diseases now mentioned, and especially when connected with biliary obstruction, it is more or less associated with acidity of the prima via. Fluid eructations often proceed from over-loading the stomach, and from organic lesions of the stomach, or liver, or spleen, or pancreas; and in these diseases they may be either tasteless, or sour, or saltish. These may also precede an attack of gout, or accompany calculous affections; but, when they are of long continuance, or are not materially influenced by treatment, they should be then referred to organic lesions either of the stomach, or of one of the collatitious organs. It should, however, not be overlooked, that the most dangerous diseases of these may occur without these eructations appearing in a very prominent form. As to the signs furnished by appearances of matters thrown off the stomach, see the article Vomiting.

132. iii. Intestinal Flatulence, as well as gastric flatulence, should not be imputed to decomposition of the ingesta, or of the contents of the canal, owing to their retention; but rather to irritation of the mucous surface, in connection with impaired tone of the muscular coat, and with general debility. Although certain ingesta may favour the generation of flatulence, or even furnish a portion of the gases producing it, especially in cases of intestinal flatulence, yet it cannot be disputed, that the gases which accumulate in the digestive canal are chiefly an exhalation from the villous surface. In some cases, especially at an advanced stage of diseases of the digestive tube, the accumulation of gas occasions a tense and tympanitic state of the abdomen, and generally increases the severity of the disease and the sufferings of the patient. Gaseous collections in the stomach or bowels, or in both, are apt to occur, in many diseases, as a contingent and intercurrent phenomenon; but in other maladies they are more distinctive symptoms, and should receive due attention, as evincing not merely the nature, but also the issue of the disease. These collections are most frequently formed in very young and in aged subjects, in persons of sedentary habits, in catarrhal irritation of the stomach and bowels; in the several affections and maladies of these viscera, and of the associated and connected organs; in the gouty diathesis and in the atonic forms of gout, in hysteria and hypochondriasis; in puerperal and adynamic fevers, and in obstructions of the intestines by any mechanical or other cause. These symptoms are aggravated by certain kinds of ingesta, especially by raw or bulky vegetables, and by peas, beans, or any preparations of these, also by hot spices, or by irritating and indigestible substances.

133. When the gaseous exhalation is attended by rumbling noises — by *borborygmi* — as in hysteria, a spasmodic or an irregular action of the muscular coats of the canal is present, propelling the distending flatus in various directions. Borborygmi in the course of low fevers sometimes precede a favourable crisis. The discharge of flatus by eructation is often of service in the more severe diseases in which gastric or intestinal flatulence are prominent symptoms; but the escape of it *per anum* is much more favourable, especially in ileus, in colicky affections, and in obstructions of the bowels. Intestinal, as well as gastric, flatulence is generally connected with acidity of the bowels, and often also with obstructed or morbid states of the biliary and intestinal secretions and excretions, and not only with these, but often also with a self-contaminated state of the circulating fluids, especially in the portal vessels. These states are more particularly manifested in the atonic forms of gout, in adynamic fevers, and occasionally in calculous or gravelly affections. In these diseases and contingently in many cases of other complaints, the deficiency of a healthy bile not merely renders the villous surface more prone to exhale a gaseous fluid, but also favours morbid changes in the intestinal contents, the fæcal excretions being morbid in colour, consistence, and smell; the odour being sour and offensive.

134. iv. The Intestinal Evacuations should receive the most attentive examinations in all diseases, but particularly in those which are severe or obstinate; and these examinations should be made in respect of the successive evacuations passed from the period of the previous visit. An inspection of the tongue, mouth, and throat, and an examination of the several regions of the abdomen, by pressure and percussion, should also be made, either immediately after or before, generally after, the stools have been examined, inasmuch as the state of these may suggest modifications in the examination of the abdomen.

135. The intestinal evacuations may be either too few, or too frequent — after protracted intervals, or at unusually short intervals. They may be variously disordered or unhealthy; and the discharge of them may be preceded and attended by much and diversified disorder. These severally as well as in connection will direct the diagnosis and prognosis of the physician. The derangements of defæcation — the disorders in which either the retention, or the frequent discharge, of the fæces, depend chiefly upon the states of the digestive canal, have been fully described in the

articles Costiveness and Constipation, Colic, Ileus, Concretions in the intestines, &c. and in those on Diarrhœa, Cholera, and Dysentery. These diseases being considered in connection with the more important complications they present in practice, and with the states of the intestinal evacuations, comparatively little remains to be noticed at this place.

136. *A. Retention or delayed evacuation* of the intestinal contents is observed in various diseases as an important symptom, independently of being itself a distressing disorder. — 1st. It is often a symptom of serious diseases of the digestive canal, of the liver, spleen, kidneys, and sexual organs; — 2d. It is frequently caused by mechanical obstructions furnished either by the parietes of some portion of the canal, or by substances retained in, or obstructing the passage through, the canal; — 3d. It may be entirely symptomatic of disease of the brain, spinal chord, and thin membranes, of hysteria, melancholy, mania, &c. — (*a.*) The remarks offered when treating of Costiveness and Constipation, of Colic and of diseases of the Cæcum and of the Colon, sufficiently elucidate many of the most important topics connected with constipation from disorders of the bowels themselves; and in gastritis, enteritis, hepatitis, and in other diseases of the abdominal viscera, costiveness and the appearance of the evacuations claim strict attention; the spontaneous return, or the easy production of intestinal evacuations, and a more natural or healthy appearance of them furnishing a most favourable indication; whilst a more obstinate retention, either with increase of painful symptoms, or with painful but abortive efforts at evacuation, evinces an increase of danger. In enteritis, the fæcal retention is occasioned chiefly by loss of the muscular or peristaltic action of the inflamed portion of bowel, and by the consequent distension of that and adjoining portions by flatus. The occurrence of evacuations indicates the removal, either partially or altogether, of these and other pathological conditions which caused the retention, and the subsidence of the inflammation, of which these conditions were the consequences.

137. (*b.*) The mechanical impediments furnished by portions of the parietes of the digestive canal, are either *spasmodic* or *structural*. *Spasm* of portions of the canal interrupting the passage of the fæcal contents towards the anus is very frequently observed in the course of Dysentery, Colic, Lead Colic, Hysteria, Gout, Hypochondriasis, &c., and sometimes contingently on other maladies. In many of these cases, the fæcal discharges are hard, lumpy, scybalous, &c., and are evacuated with antecedent or coëtaneous pain or gripings, and often also with flatus. In these complaints free and copious evacuations and a more natural state of the discharges are favourable circumstances. In most of these, the obstruction to evacuation is not only in the spasmodic state of portions of the bowels, but also partially in the inactive condition of other portions, or in the distension of these portions by flatus. *Structural changes* often take place in the parietes of the intestinal tube, and interrupt the passage of the fæces along the canal, by contracting or stricturing the intestine. Various lesions, external to the bowel, by pressing upon or strangulating a portion of it, produce a similar, or even more rapidly dangerous results. These alterations are severally described in the articles Colon, Digestive Canal and Duodenum, and when treating of Colic, Ileus, Constipation, Dysentery, &c.

138. Various substances, either formed in the digestive organs or passed into the stomach or bowels, and even intus-susceptions of portions of the intestines themselves, occasion fæcal obstruction, and always dangerous, and very often fatal consequences, as fully shown in the places just referred to, and when treating of Concretions, Biliary and Intestinal. Several indigestible substances may be swallowed, owing to a vitiated appetite, and be formed into masses more or less concrete or consistent, causing dangerous or even fatal results. A lady was in the habit of chewing and swallowing sealing-wax, and persisted in the practice for many months. Another, to whom I was also called, swallowed wax in every form, but chiefly as it existed in candles. Three young ladies came under my care who had long been in the habit of chewing and eating paper of various kinds. In all these, at first costiveness, and afterwards constipation, with colicky symptoms, and severe suffering, supervened. The perverted appetite was suspected and admitted. The means used to remove the obstruction were successful in all these cases, and brought away large and concrete masses of the substances thus unnaturally taken, mixed with mucus and fæcal accumulations. It is chiefly when intestinal obstructions are produced by one or other of the causes now mentioned, and, in much rarer instances, by intestinal worms, collected in large balls in hardened fæces and mucus, that the most dangerous consequences are to be dreaded from them.

139. (*c.*) In all inflammatory and organic diseases of the brain, spinal chord, or their membranes, constipation is a common symptom; but the danger does not depend upon the obstruction to fæcal evacuations in these cases, although it may be increased thereby. In these diseases the obstruction is generally overcome by medicine, but returns if the means for procuring evacuation be not frequently repeated. When vomiting accompanies constipation in these, the danger is increased, yet not in consequence of the latter being more obstinate or irremovable, but of a greater severity of the disease of which this is merely a symptom.

140. When obstruction to fæcal evacuation is followed by vomitings, the prognosis is unfavourable, especially if the obstruction have continued long. The danger increases in these cases if distension and tension of the abdomen, if pain or tenderness, or increased frequency of pulse, great debility or exhaustion, &c., supervene. It is still greater, the result being nearly always fatal, if the vomited matters have a fæcal smell; if flatulent distension be great and be attended by borborygmi, and if hiccup, or flatulent eructations be frequent or distressing. If the obstruction be suddenly removed, and evacuations more or less abundant be passed, pain or debility, or irritability of stomach still continuing, the prognosis is very unfavourable. If the pain and intestinal obstruction be suddenly removed, the vomitings, or hiccup, or abdominal distension still continuing, a fatal result will soon follow, and the sooner, the

weaker and more rapid and irregular the pulse, and the colder the extremities.

141. If constipation be attended by frequent abortive efforts to evacuate, or by tenesmus or straining, obstruction is generally present in the rectum, and often is produced by internal hæmorrhoids, or by stricture of the rectum, or by an enlarged ovarium or uterus, or by displacement of the uterus, or by enlarged prostate. Costiveness, in tubercular consumption, is more favourable than diarrhœa. An alternation of constipation and diarrhœa indicates serious chronic or structural disease of the digestive organs; and, in children, that the mesenteric glands are affected, chiefly enlarged. If constipation follow the sudden cessation of diarrhœa, and become obstinate, the prognosis is unfavourable; more especially if pain, tenderness, tension or distension of the abdomen be also present, and the tongue become dry or parched.

142. B. *Frequency of the intestinal evacuations* depends much on the age and habits of individuals. Infants evacuate the bowels twice or thrice daily, adults generally once only, sometimes twice, old persons even less frequently, and sedentary persons, who eat little, only once in two, three, or even in several days. Great frequency of evacuation, or purging, is always occasioned by disease of the digestive canal,—most frequently by irritation and hyperæmia of the digestive villous surface. The purging, when continuing for some time, constitutes diarrhœa, but when it ceases spontaneously after the bowels are unloaded, or after a short time, from the operation of medicine, it hardly amounts to the latter. Purging or diarrhœa is frequently owing to teething in children, and is a common complication in exanthematous fevers, and in gastro-enteric catarrh. In these cases it is also pathologically characterised by irritation with hyperæmia of the digestive villous surface. When it follows ingurgitation of food or intoxicating liquors to excess, or fæcal accumulations, or the irruption of accumulated bile into the bowels, it is thus similarly characterised, and generally subsides spontaneously, especially if due abstinence be adopted; but when it occurs as a complication of exanthematous or gastro-enteric fevers, or in child-bed fevers, the spontaneous cessation of it should not be trusted to, means to moderate or to arrest the inordinate action being then required.

143. When diarrhœa occurs in the course of adynamic or putro-adynamic fevers, asthenic inflammation of the intestinal villous surface and of Peyer's glands should be dreaded, and indeed it may have far advanced, especially if the stools present an ochry appearance. In such cases the danger is very great—very considerable if the diarrhœa have been of some duration, and extremely great if the stools have this appearance, or are intimately mixed with blood. Diarrhœa is also a most dangerous symptom when it supervenes upon chronic disease of the lungs, or of the liver, or spleen; and when it is connected with diseased mesenteric glands. Whenever the state of the evacuations shows either a protracted absence of bile, or an intermixture of blood, the prognosis should be unfavourable, and at a far advanced period of chronic or of hectic diseases, the danger should be considered as very great or extreme. When stools are passed immediately after substances have been received into the stomach, and more particularly if they have passed but little changed from the state in which they were taken, a fatal result may be expected in the great majority of instances, and disease of the mesenteric glands, and often also of other collatitious viscera, may be inferred.

144. Diarrhœa following vomiting often subsides spontaneously, especially when the cause consists of irritating ingesta, or overloading of the stomach. The same prognosis may be entertained if the diarrhœa follow constipation. If diarrhœa and vomiting, with or without spasms, be of considerable duration; if they occasion sinking, &c., or if they be produced by poisons of an irritant and depressing nature, danger should be inferred, especially if spasms be present and continue. (See Art. CHOLERA and CHOLERIC FEVER OF INFANTS.) In most instances of diarrhœa, the previous history of the case, the diseases of which it is a consequence, or a complication; the existence and character of nervous symptoms; the amount of nervous or vital depression accompanying it; the nature and character of the prevailing diseases and of the dominant epidemic constitution, especially in connection with the exanthematous and continued fevers of which diarrhœa is so frequent a complication, should severally receive due consideration before we form conclusions either as to the result, or as to the indications of cure.

145. If diarrhœa be attended by pains following the course of the colon, or by tormina, then the colon may be considered as the chief seat of the affection. (See Art. COLON and DYSENTERY.) If the pains extend down the sacrum, or between the sacrum and pubis to the anus, or if they be accompanied by dysuria or ischuria and by tenesmus, the rectum is also affected. If diarrhœa or dysentery be attended by spasm of the sphincter ani, inflammation often with abrasion of the mucous surface in the vicinity may be inferred. If, in these diseases, the sphincter ani become relaxed or paralysed, an unfavourable opinion of the result may be entertained, and more especially if this occur in the course of diarrhœa complicating exanthematous, or typhoid or adynamic fevers.

146. If purging or diarrhœa, occurring in the course of visceral congestions, especially those of the liver or spleen, or in dropsical effusions, or in hypochondriacal affections, or as a sequela of agues, appear to give relief; or be followed by greater animation or increased strength and activity; and if either occur in the course of fevers and other acute diseases, as a critical evacuation, being moderate in frequency and continuance, and the evacuation of a more natural and healthy character, a very favourable issue may be expected. (See Art. CRISIS.)

147. C. The ALVINE EVACUATIONS furnish important information as to the nature, complications and issue of both acute and chronic maladies. The fæces are altered by disease, in form, in consistence, in colour, in odour, in quantity, in the nature of their constituent elements or materials, and in the substances they contain, or that are passed with them.—(*a*.) The *form* and *consistence* of the evacuations vary with the age of the subject. The fæces in infants are pulpy and generally without form. In adults, they are usually

formed and more consistent, and in aged persons they either continue so, or become much harder and less bulky. At all ages, however, after infancy, they present every grade of consistence, from fluid to solid, according to the states or affections of the digestive organs. In cases of spasmodic or permanent stricture of the rectum or anus, or of internal hæmorrhoids, the evacuation is of small calibre, and often presents the appearance as if the fæcal accumulation were pressed through a diminished aperture, in continuous or broken, but considerable lengths, and of the same diameter. If there be enlargement of the prostate, or displacement of the womb, the evacuation is generally more or less flattened. The discharge may be lumpy, may resemble pigeons' eggs in form, be hard or very consistent, or scybalous. It is generally of these shapes in dysentery, colic, hysteria, sometimes in hypochondriasis and in several other diseases. In dysentery, these lumps or balls are accompanied either with a serous fluid, or with mucus mixed with blood, or with both, proceeding from the inflammatory irritation of the mucous membrane, accompanying the spasm of the muscular coats and the flatus, which chiefly occasion this form of the fæces in these complaints. Indeed whenever the stools present this lumpy or scybalous form, a spasmodic and flatulent state of the bowels, especially of the colon, may be inferred; and costiveness is generally present.

148. In some cases, especially in chronic dyspepsia, with impaired action of the liver, the stools are tenacious, figured and consistent, resembling putty in tenacity and sometimes also in colour. For these, stomachic or chologogue purgatives are generally required. In aged and sedentary persons, especially females, and often also when the liver is torpid or obstructed, fæcal matters accumulate in the sigmoid flexure of the colon, and in the rectum, distend the bowel, sometimes beyond the power of reaction or propulsion, and become hard and dry, owing to the absorption of their more fluid constituents. In this state, the lower bowel, especially the rectum, may be closely plugged up, the natural efforts to overcome the obstruction being accompanied with tormina, and continuing abortive until the concrete fæces are removed from the over-distended and obstructed rectum by mechanical aids.

149. (*b.*) *The colour* of the stools is very materially affected by the ingesta. In children the fæces in health are generally yellowish, in adults brown, in old persons dark brown. They are rendered much darker by port-wine or claret; by extract of liquorice, and by most of the dark fruits; and still darker or nearly black by all the preparations of iron, and by all articles of diet containing blood, as black puddings. They present a greenish hue, more or less dark or deep, after green vegetables, especially spinach. After rhubarb they are often yellow, and after magnesia or sulphur, or both, they are often paler than natural. The preparations of mercury often cause the fæces to assume a greenish hue, probably in consequence of the state of the biliary and intestinal secretions, and of acidity of the prima via. The compound decoction of aloes often imparts a darker hue to the stools.

150. (*c.*) *The odour* of the evacuations seldom continues the same as in health, in either acute or chronic diseases, and, when they return to their natural odour and colour, the circumstance is favourable. The more offensive the odour of the stools, the disorder of the intestinal secretions and excretions, the accumulations of them in the prima via, and the depression of vital power, may, either severally or conjoined, be inferred to have been also the more remarkable, unless indeed some preparation of sulphur have been taken and given the discharges the odour of sulphuretted hydrogen. If the stools have an earthy smell, and more especially if they have the odour of raw flesh or of putrid meat, a most unfavourable prognosis should be given, especially in gastric or intestinal fevers, in dysentery or in other diseases implicating the bowels. When the stools have a sour smell, then diarrhœa, or obstructed biliary discharge, or both, are generally present, and acidity of the intestinal contents clearly exists. This symptom is frequent in the diarrhœa of infants and children, and previously to, or during an attack of gout or rheumatism. The stools in pestilential and infectious maladies have a most offensive odour, which is peculiar to each malady, as in choleric pestilence, small-pox, &c.

151. (*d.*) *The colour* of the stools is variously changed in disease. It is pale, greyish, clay-like or nearly white, in all cases of biliary obstruction, whether accompanied with jaundice or not. In the more chronic biliary obstructions, and in the darker shades of jaundice, the colouring and other ingredients of the bile are altogether wanting, the stools are nearly white, unless when partially coloured by the ingesta; and the slightest indications of the presence of bile in the stools are to be viewed as a favourable occurrence. A greenish hue of the stools occurs in several disorders of the digestive organs, and in scrofulous or other organic diseases of the brain. A deep brown, or greenish-brown colour of the stools is generally owing to the passage of bile, which had been accumulated for some time in the gall-bladder and hepatic ducts, into the bowels; and a yellowish, or bright yellow tint may be imputed to the passage of recently formed bile into the intestines. Black stools are generally produced by the presence of blood, which may have passed into the stomach either from the nose, gums or mouth, or from the pharynx, or may have exuded from the internal surface of the stomach or small intestines. When blood is partially digested and intimately mixed with the contents of the bowels, the uniformly black hue presented by the fæces has been ascribed to black bile, which had been long retained in the biliary apparatus; others admitting that this colour is produced by blood have believed that the blood has escaped from the secreting structure of the liver along the ducts. In favour of this latter opinion we have no satisfactory evidence. The source of the colour in these doubtful cases may be determined by diluting the stools, when they will assume a more determinate red or green, according as the colour is owing to blood or to bile. An ochry colour of the stools is generally produced by numerous ulcers, seated in the glands of the villous surface, the blood exuded in small quantities from these being intimately mixed with the contents of the intestines, which are usually in these cases more or less fluid.

152. When blood is exuded in small quantity in any portion of the digestive canal above the valve of the cæcum, it is generally mixed intimately with the fæces. But, even when poured out in the small intestines, it may be passed by stool almost pure, although often grumous and uncoagulable, when the quantity is considerable or large, or the bowels irritable. Blood, imperfectly mixed with fæcal matters, dark-coloured and uncoagulated, may have come from either the small or large intestines. When it proceeds from the latter, it is often pure, red, and coagulable, and generally precedes or accompanies the evacuation. When it follows the passage of fæces, it commonly proceeds from the rectum, and is a consequence of internal piles. The blood thus discharged per anum, either alone or mixed with fæces, may be an exudation from an irritated portion of the villous surface, or a discharge from an ulcer or ulcers, or from a diseased vein, or an exudation occasioned by the association of irritation with a semi-dissolved condition of the blood itself. Bloody stools, either ochry, black, red, reddish brown, &c., occur in adynamic or typhoid fevers, in scurvy, in purpura, in organic diseases of the liver or spleen, in dysentery, in cancer implicating the digestive canal, in vicarious menstruation, hæmorrhoids, and contingently on several other maladies. Although the quantity of blood extravasated in these diseases may be barely sufficiently to colour the stool, yet it may be so great in other cases, as to excite fears of speedy dissolution, especially in fevers, and in organic lesions of the liver or spleen. These excessive hæmorrhages are always dangerous, especially in the more advanced stages of adynamic fevers. Nevertheless, recovery sometimes takes place, even in persons considerably advanced in life. I lately saw, within a short period of each other, two cases of this kind, with my friends Messrs. Houlton senr. and junr.; and, in these, although the loss of blood was remarkably great, recovery took place in both. The quantity of blood may be very small, or may merely streak the mucus, or discolour the serum, in which it is passed, and yet the danger may be extreme, as in ileus, volvulus, or intus-susceptions, in enteritis, in dysentery, the attendant symptoms more prominently evincing the danger. A raw, earthy, or putrid odour of the stools, in these cases, is the most unfavourable sign which can accompany the presence of blood in the stools, whatever may be its quantity.

153. The discharge of blood by stool in moderate quantity may produce relief in several diseases, especially in those of the liver or spleen, and in hæmorrhoids. But the relief may be only temporary, inasmuch as the disease or lesion, which occasioned it, may not be removed by it, and may proceed after a period of relief, this discharge recurring, or some other results being produced. In all cases of this kind the prognosis should depend upon the effects produced by the loss; by the existence or non-existence of anæmia, or of vital sinking; but, when such discharge occurs, in adynamic fevers, whatever may be the quantity — even no more than may be sufficient to impart an ochry appearance to the stools, then great danger is present.

154. (*e.*) *Bile* may be present in the evacuations in every conceivable quantity. The *stools* may even consist almost entirely of bile, or they may not contain a particle of it, as in choleric pestilence and in obstructive diseases of the biliary organs. A brown, or gingerbread-colour of the stools indicates a due proportion of both cystic and hepatic bile; a bright, but deep orange hue evinces a preponderance of hepatic bile, and, when the stools consist chiefly of a fluid of this tint, becoming darker after it is passed, then they may be viewed as bilious, or consisting in a great measure of bile mixed with more or less fæcal matters. Superabundance of bile in the stools is generally caused by chologogue purgatives prescribed at a time when the biliary ducts and gall-bladder have been loaded with this secretion, or by excitement of the liver, in connection with the influence of high ranges of temperature, or with passion or intemperance, or by any cause productive of irritation of the duodenum or of the common bile-duct.

155. The stools may present various forms and grades of consistence, both when well coloured and abounding with bile, and when deficient in colour and in bile. When thus deficient, they may be watery or serous, as in diarrhœa and pestilential cholera, or pultaceous or thin, as in jaundice, or in torpor and various states of obstruction, of the liver, or costive or hard in rarer cases of biliary obstruction, either with or without jaundice. Deficiency of bile, the stools presenting either of the characters just mentioned, but most frequently a thin or pultaceous consistence, is a symptom of torpor of the liver, as in many persons who have resided long in an intertropical climate, of obstruction of the ducts from constriction or contraction consequent upon inflammation, or from the impaction of a biliary calculus, and of the several organic changes described in the articles Jaundice, Gall-bladder and Ducts, Liver, &c.

156. (*f.*) The stools may contain more or less *serum*, as in the serous diarrhœa, which proceeds chiefly from inflammatory irritation of the mucous surface of the intestines, and which presents a brownish, or dark brown hue, in the more chronic cases, and when the liver or spleen is implicated; or they may consist almost entirely of serum, containing small albuminous flocculi, and present a pale and turbid appearance, or resemble rice-water, as in the diarrhœa of choleric pestilence, in which they are frequent and most abundant, and constitute the most dangerous symptoms of the malady. The continuance of pale, turbid or serous evacuations, without any appearance of bile, is always a dangerous circumstance, especially after rational means have been used to arrest them, and to procure a secretion of bile, or when they are very forcibly discharged or squirted from the anus. In pale, watery or serous stools, insufficiently coloured with bile, especially when passed frequently, and the affection having been of some considerable duration, substances which had been recently taken into the stomach are often passed either but little or not at all changed from the state in which they had been swallowed. This *Lienteric form* of diarrhœa is always most unfavourable, especially in infants and children, after weaning, or during dentition, or that have been deprived of their nurses' milk. (See Art. Diarrhœa, § 12.) The occurrence of serous diarrhœa with vomiting in

infants and children in warm summers and autumns, indicates serious and often very dangerous disease, especially when attended by fever. (See Art. Choleric Fever of Infants.)

157. Various substances, foreign to a natural state of the evacuations, are sometimes found in them, besides serum and blood. These are chiefly mucus, pus, fibro-albuminous exudations, fatty substances, cholestrine, biliary calculi, various kinds of intestinal concretion, worms either dead or living, portions of the mucous coat detached from the subjacent tissues, and even portions of intestine thrown off, in consequence of intus-susception and the consequent changes. These severally require but little remark.—*a*. *Mucus* occurs in *Dysentery* and *Diarrhœa*, and is often mixed with serum and pellets, or lumps of fæces. In the mucous state of the stools, the follicular apparatus, with the villous surface, is chiefly inflamed; but this appearance may pass into a watery or serous condition, or even into a mixed state, in which the evacuations are more or less streaked with blood as in dysentery. If ulceration supervene, the evacuations contain sanious matters, or blood in larger quantities.—*b*. *Puriform* stools, or an admixture of *pus*, with fæcal matters, may follow mucous evacuations, as in chronic diarrhœa, or chronic dysentery, especially when the puriform matter is much diluted or mixed with mucus; but, when it is present alone, or in large quantity and unmixed, or but little mixed with fæces, then the rupture of an abscess, seated either in the liver, or in the spleen, or in the vicinity of the spinal column, into some part of the intestines, may be inferred. A change of mucous to serous, or to muco-puriform, or to sero-sanguineous, or to sanious, or to puriform, stools, or to intestinal hæmorrhage, indicates a progressive advance of disease — generally of structural change; inflammatory irritation advancing to suppuration or ulceration, with the several changes described when treating of Diarrhœa, Dysentery, and Fever.—*c*. The passage of *fatty substances* in the stools occurs in rare instances, and has been observed chiefly in malignant and chronic visceral diseases, as in those of the liver, pancreas, duodenum and lungs. The other substances sometimes passed from the bowels, of which no notice need be taken at this place, are described in the article Concretions, *intestinal*, and in the other articles on diseases of the Intestines, &c., — on Worms, &c.

158. (*g*.) In all cases in which it is necessary to examine the state of the intestinal evacuations, and, indeed, in almost every case which comes before the physician, the several regions, not only of the chest, but also of the abdomen, should be carefully examined by percussion, and by pressure, directed according to the peculiarities of individual cases; and the sensations of the patient, as well as the sounds emitted, should be carefully considered. When pain is experienced either previously to, or during, or after evacuations, its character and connection with defæcation ought to be ascertained. In addition to these points, the strength, nutrition, and vital manifestations of the patient, as well as the performance of the several excreting functions, should receive attention. (See Art. Abdomen).

159. IV. Symptoms and Signs connected with the Circulating Systems.—When treating of Auscultation, of the Aorta, of the Arteries, of the Blood, of the Heart, of the Lymphatic and Lacteal System and Glands, of the Pulse, and of the Veins, the Semeiology *of the Circulating Systems* was fully considered, especially as respects diseases of these systems. It therefore only remains for me, at this place, to notice only those topics which have either been omitted or insufficiently discussed under these heads.—

160. i. In the articles on Auscultaton and Heart and Pericardium, I have described the physical signs of the heart and its capsule. The healthy and morbid sounds of the heart were topics of discussion when these were written, and they still are by no means satisfactorily determined. The interruptions, obstructions, or difficulties, to the passage of the blood through the several cavities and orifices of the heart, besides being accompanied by certain physical signs, described under these heads, give rise to several physiological or functional symptoms which ought also to receive due attention. The chief of these are — 1st. Short or difficult breathing, varying from a scarcely appreciable disturbance to dyspnœa or to orthopnœa; and often at first overlooked, or hardly complained of unless when ascending stairs, or a height. — 2d. Attacks of faintness, or of syncope, followed or not by palpitations, &c.; — 3d. Paroxysms of difficulty of breathing, or startings from sleep, especially about one of the earliest hours in the morning. — 4th. A sensation of sinking, or of suffocation, or of dissolution, upon walking quickly, or against the wind, or upon any physical exertion. — 5th. Congestion of the brain, owing to obstructed return of blood, occasioning vertigo, head-ache, or apoplexy, palsy, &c., if not prevented by epistaxis. — 6th. Congestions of the lungs, often causing hæmoptysis, pulmonary apoplexy, œdema of the lungs, or serous effusions into the thoracic cavities. — 7th. Œdema of the lower and upper extremities, and often also of the face, in the morning; or asphyxia by accumulations of mucus in the bronchi.— 8th. Lividity of the lips, tongue, gums, fingers and nails. These cannot, individually, be assigned to certain or determinate organic lesions, but may severally accompany or supervene upon one or more of these lesions. Certain of them may even be present without any structural change of the organ, as shortness or difficulty of breathing may be a symptom of anæmia, or of chlorosis. Faintness or syncope, with or without a feeling of dissolution, is most frequent in passive dilatations of the cavities, or in cases of fatty softening of the parietes, of the heart, with or without ossification of the coronary arteries.

161. *Palpitations*, as well as irregularities, and intermissions of the heart's contractions, &c., attend several organic lesions of the organ, and they may occur independently of any of these, and merely as a consequence of weakness or other disorder of the digestive organs, or of irritation of some viscus with which the heart sympathises. When palpitations follow mental emotions or sudden shocks they soon subside, or are followed by depression or faintness; or when they are consequent upon hysteria, or irritation or excitement of the sexual organs, the heart's action returns to its normal state. But, in cases of chronic debility, of exhaustion from prolonged

discharges, or from over-exertion or from inanition, or from prolonged anxiety, even independently of any manifest organic lesion, palpitations may frequently return, be alternated with faintness, or with irregularity of action, or even be characterised by such irregularity. In these latter circumstances, organic nervous power is more or less impaired, as respects the heart, especially in cases of faintness with or without any of these states of irregularity; or this power is irregularly distributed or determined, as in cases of nervous palpitation, in most cases of which it is also considerably weakened; the impaired tone of the muscular coats of the digestive canal, also generally present in these cases, admitting of flatulent distensions and fæcal accumulations, and thereby increasing the cardiac disorder. Indeed the parietes of the heart very often participate in the impaired vigour or tone of the coats of the stomach and bowels, flatulent distension of these impeding or interrupting the return of blood to the auricles, and thus preventing either the filling, or the dilatation of the cavities of the heart. When palpitations, attacks of faintness, or irregularity or intermission of the heart's action take place without being attended by any auscultatory sign, impaired influence or energy of the organic nervous system — constitutional or organic nervous debility is then generally present, although some change of structure, not indicated by the impulse or sounds of the heart, may also be present, as in cases of fatty softening, or of impaired nutrition of the parietes of the organ, or of disease of the coronary arteries. When treating of diseases of the Heart, in 1836, I directed attention to fatty degeneration of the substance of the organ (see that Art. §§ 224. *et seq.*); but, although this change may be admitted to be a consequence of impaired or morbid nutrition of the organ, often in consequence of ossific or other deposits in the coats of the coronary arteries, yet both softening and impaired nutrition of the muscular structure of the heart may take place without fatty degeneration in any very manifest degree being present. In all such cases, however, faintness, remarkable shortness of breathing, a sense of dissolution on walking fast, or on exertion, are generally observed.

162. ii. Congestion of the Cavities of the Heart may occur, either from general vascular plethora, or from a greater or more rapid return of blood to the right side of the heart than can be sent onwards by the ventricle, or from weakness, or dilatation of the parietes of the organ, or from obstruction to the circulation by material or mechanical causes. Either of these pathological conditions may produce this effect, or any two, or all of them may exist in the same case, and may even, without any further appreciable change, either terminate life or place it in imminent jeopardy, the distension of the cavities having been too great to be removed by the impaired or exhausted power of their parietes, or the material obstruction being too great or prolonged to be overcome by the weakened action of these parietes. In cases of this kind the patient experiences, whichever of these pathological states obtain, extreme oppression and a feeling of distension in the cardiac region, with great alarum, choking, dyspnœa, or orthopnœa, and often also with a sense of impending dissolution. The congestion is not limited to the cavities of the heart, but extends to the large vessels, especially to the veins, and the action of the organ is either weak, or irregular, or tumultuous and inefficient. The congestion is evidently connected with over distension of the cavities, as shown by the increased sphere of dulness on percussion, by pain in the left shoulder, or under the shoulder-blade, often extending to the arm. Death may ensue if the congestion be not removed, partially or altogether, either by stimulating or reinforcing the power and action of the heart, or by diminishing the distending mass of blood by depletion, or by the combination of both. When this event takes place, it may be imputed to some other pathological state than this, as to spasm of the heart, especially when the orifices, valves and parietes of the heart present no very manifest lesion, the post-mortem changes, or even the last struggles of existence removing the congestion, either wholly or in part, by which life had been extinguished. The slighter states of congestion of the heart are frequently present in *Hysteria.* (See Arts. Congestion and Heart, *Pleuries.*)

163. iii. The Symptoms and Signs furnished by the Arterial and Venous Systems.—Little remains to be added to what has already been advanced on this subject in the articles Aorta, Arteries, Pulse, and Veins, to which the reader may be referred. When treating of the *Pulse* I have pointed out the Semeiology, comprising both the *diagnosis* and *prognosis*, of arterial action. There is generally heard, by means of the stethoscope, a dull weak sound in the tract of the larger arteries, and this sound is variously modified, according to the state of the blood and the thickness and tone of the arterial parietes. If the blood be thin, or watery, or poor in hæmatoglobuline, or if the arteries be thin, and the blood deficient as respects the capacity of the vessels, the sound of the arteries at every systole of the ventricles is clearer and approaches nearer to a bellows or blowing sound. This sound is single and ceases with the systole of the ventricles. Pressure on the artery developes this sound, which is imputed to the friction of the blood-current or wave against the coats of the artery at each contraction of the ventricle.

164. *A. Morbid arterial sounds* are either *simple* or single or *double.*—*a.* The *simple* or intermitting bellows-sound is observed when tumours press on arteries, in aneurisms, in cartilaginous and ossific deposits in the coats of arteries, and when the circulation is accelerated, especially in chlorotic or anæmied persons, and after large losses of blood. It is generally sibillous in tone or character, varies in strength and loudness, and is isochronous with the termination of the systole of the ventricles.—*b.* The *double* or continuous bellows-sounds are heard chiefly in the carotid and subclavian arteries, but seldom with equal strength in both. Of these two or double sounds, the first is the stronger; and when they are loud or high, they become whizzing, buzzing, rumbling or piping, or sibillous; but pressure on the artery, the position of the head, &c., produce various modifications of these sounds, which, however, are generally loudest with the systole of the ventricles.

165. *B. The Capillary vessels* of various parts of the surface, especially in febrile, exanthematous

and cachectic diseases, furnish indications of some importance as respects vascular action and vital power. Pressure in cases characterised by redness or discolouration of parts of the external surface often, indeed generally, shows the cause, whether this be capillary injection or congestion, or extravasation. If the last, pressure does not materially affect the discolouration. In the first and second of these causes, pressure momentarily removes the discolouration; and the rapidity of the return of blood into the emptied capillaries is an indication of the rapidity of the circulation. When the colour is florid, the circulation is active, and vital power is not very manifestly impaired, but when it is dark-red, purplish or livid, the capillary congestion is the consequence of impaired vital power, and the circulation through the capillaries is sluggish or impeded. The capillaries become impaired more and more in vital tone with the advance of age, and are subject to the same structural changes as are described when treating of these changes in the coats of the Arteries (§§ 38. *et seq.*). When treating of these changes (in 1831), I described the *atheromatous* matter deposited in the walls of the arteries, as "a suety substance which is greasy to the touch;" and, although much more recently stated to consist of fat, or to be fatty, yet I believe that the description I have there given (see Arteries, § 59.) to be the more correct, as with fat other chemical constituents and animal products are conjoined.

166. *C. The veins* furnish indications of pathological states by their size and distension, by their varicose conditions, by the rapidity of their distension when pressure is applied in their course to the heart, and by their pulsations. The veins in the temples, face and neck are distended in cases of congestion of, and vascular determination to, the brain; and when this state is viewed in connection with other symptoms, the distension not being caused by attendant convulsions, then vascular depletion is generally required. A distended or varicose state of the veins in any of the extremities evinces obstruction of the venous trunk, or large branches, owing either to obliteration, pressure or other changes described in the article Veins. The rapidity with which the veins refill, after having been emptied by friction, followed by pressure in their courses, as well as their size and fulness, serves to show the degree of fulness, or of deficiency, of blood in the system. The veins are small in youth, and in corpulent persons; they are large in the aged, and in the emaciated, this state admitting and showing fulness or enlargement of the veins, especially of the extremities. In the aged the veins lose their tonicity, and are more prone to congestion, and to retarded or obstructed circulation, especially when the circulation has to overcome the gravity of the column of blood in the veins.

167. A venous pulse is sometimes seen. It occasionally results from the continuation of the heart's action through the capillaries to the veins, when this action is inordinately excited, and is owing in some respects to the reaction of the capillaries upon the distension caused by the contraction of the ventricle, impelling the blood-wave onwards. The pulsation in other cases may be caused by an artery lying under or near a vein; and in some instances the pulsation is retrograde, as in the jugular veins, and in these it is a most important sign of cardiac disease, and is produced by contraction of the right ventricle, and regurgitation of blood, owing to dilatation of the right ventriculo-auricular orifice, or to imperfection of its valve.

168. *D. The Blood itself* furnishes most important signs of the nature and probable issue of disease. Of the signs which this fluid — vital in its relation with the several viscera, but more especially with the ganglia and ganglial nerves which supply the vascular systems — presents in disease particular notice has been taken when treating of the several forms and complications of disease, in the articles specially devoted to them, as well as in the comprehensive article on *the changes observed in the blood in disease.* (See Art. Blood.) To these, but more especially to this last, I must refer the reader, as nothing of any interest or of the least importance has been added to our knowledge beyond what may be found under those heads, and more particularly the last. *Spontaneous discharges* of blood and the sources and appearances of the blood thus discharged, furnish very important pathological and prognostic indications, but these are fully considered in the article on Hæmorrhage.

169. iv. The Lymphatic System—*vessels and glands.*—This system furnishes but few signs of disease beyond those which appertain to the maladies occasionally seated in them; and these signs are described in the articles on the Lymphatics and Glands, Scrofula and Pestilence, Glandular. Enlargements, inflammations, &c., of the lymphatic glands, and inflammation of the lymphatics themselves, are generally produced by some irritation, sore, or puncture, or by the inoculation of some poison in a situation near to, or beyond the seats of these affections. Enlargement of the glands near the base of the cranium, or in the upper region of the neck, is often observed in cases of scrofulous or tubercular meningitis and softening of the brain, in young subjects, either with or without effusion of serum in the ventricles, or between the membranes; and similar affections of the glands, either near the sternum, the clavicles, or arm-pits not infrequently precede or accompany the development of tubercles in the lungs. Enlargement, inflammation, suppuration, &c., of the glands, and even inflammation of the lymphatics, followed by disease of the glands, are very frequently occasioned by the application or inoculation of some virus, or poison, or by sores or irritation, as often shown by the introduction of the syphilitic poison into the frame, and by poisoned wounds or punctures. But independently of these causes and sources of contamination, the lymphatic glands are sometimes enlarged or congested in weak and delicate subjects, and they are occasionally asthenically inflamed and disorganised in the course of pestilential and malignant fevers; but most frequently and especially in the plague, in which pestilence the affection of these glands constitutes a distinguishing feature.

170. V. Symptoms and Signs of the Respiratory Function.—These symptoms are of the greatest importance in respect not only of the diseases seated in the organs of respiration, but also of all other maladies to which the frame is liable. More or less disturbance of the respiratory func-

tion very often attends diseases of the heart and large vessels, and the advanced stages especially of diseases of the abdominal viscera, of febrile and constitutional maladies, and of affections of the brain. When treating of Auscultation, of the Chest, of the Bronchi, Larynx and Lungs, the signs and symptoms of the function of respiration, were described with reference chiefly to diseases implicating that function. Besides the signs furnished by auscultation, percussion, and inspection and admeasurement of the chest, several other means have been recently suggested of furnishing signs of pulmonary disease, and these have reference chiefly to the determination of the quantity of air received and discharged from the lungs at each inspiration and expiration, and of the power with which these respiratory acts are performed. For this purpose Dr. Hutchinson has invented an apparatus which he has termed a *spirometer;* and in order to show the movements of the chest in health and disease, Dr. Sibson has furnished an instrument, which is called a *chest measurer.* My limits prevent me from describing these and their application to the diagnosis of pulmonary maladies, and oblige me to refer the reader for all that should be known respecting them to the *Transactions of the Medical and Chirurgical Society,* (vols. xxix. p. 137., and xxxi. p. 353.) These means of diagnosis are of more or less service, especially in doubtful or difficult cases; but they should not be confided in further than that they are useful aids to the means previously employed, and to the rational symptoms furnished by the maladies of the respiratory organs. In all diseases, whether of these, or of other organs, the *voice* and *breathing* of the patient demand the strictest attention. The Voice is especially considered in a separate article; the *respiration* or breathing will be briefly noticed at this place.

171. i. Respiration is influenced or modified by age, by sex, by temperament, by the habit of body, by mental emotions, by the states of the atmosphere, by the positions of the body, and by the sleeping and waking states, and most remarkably by disease. Of certain of these little need be said. Temperament influences the respiration chiefly in connection with the conditions of the atmosphere, and with mental emotions, the nervous, susceptible, and irritable temperaments experiencing a greater frequency of respiration during warm and humid states of the air, and when the mental emotions are more or less excited. Persons of a full habit of body, and the subjects of obesity, respire more frequently, and receive less air into the lungs at each inspiration, than the thin or the more slenderly formed; and the short in stature have a somewhat less capacity of the lungs than the tall. Much, however, depends upon the breadth or width of the chest. A person when standing or sitting breathes more fully and freely than when lying down or reclining upon either side. Hence in bronchitis, in pneumonia of both lungs, and in cases of effusion into both pleural cavities, the patient cannot lie upon either side, for this position in some measure extinguishes the motions of the side of the chest upon which he lies, and increases the difficulty of respiration. Respiration during sleep depends very much upon the position and upon the habit of body, and upon the state of the stomach.

172. *Respiration during disease* should be examined — 1st. By observing the motions of the chest, and the phenomena attending inspiration and expiration; — 2d. By auscultation, or by listening to the sounds produced by respiration in the several regions of the thorax. The *second* of these modes is considered under the head Auscultation; it furnishes chiefly signs of disease of the respiratory organs, or rather those changes of respiration which diseases of these organs produce. The first not merely evinces diseases of the respiratory organs, but also gives more or less information as to the states of the vascular system, of the abdominal viscera, and of the brain. To this *first mode* of examination a brief notice is to be directed. Attention should be paid — 1st. To the frequency and quickness of the respirations; — 2d. To the motions and degrees of expansion in the several regions; — 3d. To the states of the nostrils and mouth during respiration; — 4th. To the uniformity, the ease, or the exertion of respiration; and the relations, in frequency and exertion, of the individual respirations to each other; — 5th The states of expiration in relation to inspiration; — 6th. The sensations experienced by the patient during the acts of inspiration and expiration; — 7th. The states of the expired air, chiefly in respect of temperature and odour.

173. *a.* The *frequency* and *quickness* of breathing may each exist independently of the other. Respiration is more *frequent* than in health, when a portion of the lungs can no longer perform its functions, as in pneumonia, tubercular consumption, &c., or when the lungs are more generally affected as in bronchitis, or prevented from expanding by pleural effusions, by incurvations of the spine, or by the invasion of the thorax by abdominal or other tumours, or effusions &c. It is also more frequent when the circulation is more rapid, than in health, and passes more rapidly, or in larger quantity, through the lungs, as in febrile maladies; and when the lungs are congested by impeded circulation through the heart. The prognosis of increased frequency of breathing depends upon these causes — upon the nature of the one producing it. In febrile diseases, the less frequent the respiration relatively to the amount of fever, the more favourable is the prognosis. The breathing even in the most unfavourable circumstances very rarely amounts to sixty in a minute. Respiration may be more *rare* or *less frequent,* than in health, as when the heart's action is impeded or rendered slow, or when the brain is congested, or the basilar parts of the brain, or medulla oblongata, or cervical portion of the spinal chord, is congested or pressed upon, or in syncope, catalepsy, structural changes of the substance of the heart; in sopor, coma, or apoplexy, or in certain states of paralysis; and during the extreme exhaustion preceding dissolution.

174. *Quickness* of respiration, especially of inspiration, arises from a more rapid action of the muscles of respiration occasioned by either weakness or fatigue of those muscles consequent on paroxysms of cough, as in pneumonia, bronchitis, pertussis, or on great muscular exertions, or on pleural effusions; and in many of these cases, as in pleuritis, in pleuro-pneumonia, in pericarditis, &c., the breathing may be quick and yet less frequent than natural, especially when respiration is attended by pain. Quickness increases the danger of frequency of respiration, especially in pneu-

monia, pleurisy, tubercular, and other organic maladies. *Slowness* of breathing is very often an attendant of diminished frequency, especially in those maladies, with which this latter is mentioned in connection. When it occurs in cases of extreme exhaustion, or at a far advanced stage of acute or chronic disease, with a small, weak, or irregular pulse, sinking of the features, cold or clammy extremities, &c., it indicates approaching dissolution. But it may also occur, although not as a consequence of serious disease, as in these circumstances, in cases of nervous debility, during attacks of faintness, or it may usher in hysterical syncope, or catalepsy, and be unattended by danger.

175. *b.* The *motions* and degree of *expansion* of the chest vary much in different individuals in the same disease. The *motions* of the chest, in the several thoracic regions, should be observed, when the clothes are removed; and any difference in the degree or extent, or quickness of motion in either side, ought to be noted. Uniformity of the motions of both sides of the chest is an indication of more or less uniformity of the states of the parts contained in each. But if this uniformity is only partial, if it be absent in any region, pleuro-pneumonia, tubercular formations, pleuritic effusions or adhesions, or other structural lesions, may be inferred to exist in the region where the motion is impaired or deficient, and the prognosis is unfavourable, or should be given with much caution.

176. According to the degree of expansion of the chest, respiration is *large*, or *full*, or *small*, or very small or shallow. If the breathing be full or large, the chest expanding freely and naturally, the rhythm being equal or normal, a favourable opinion may so far be entertained; but if this state of respiration be also rare or slow, or if the rhythm be unequal, oppression or congestion of the brain, as in nervous fevers, or sopor or coma, or apoplexy should be apprehended, if not actually present; or the accession of convulsions may be expected, especially in children. Respiration may be very great or large, and yet the quantity of air received into the lungs may be very small, the lungs being obstructed by disease of the bronchi, or of their substance, or by emphysema or pleural effusions. A *small* or shallow respiration accompanies pleuritis, pleuro-pneumonia, pericarditis, hepatitis, and diaphragmitis, also peritonitis, gastritis and enteritis, owing to the increased pain or uneasiness occasioned by a fuller or larger expansion of the chest; and is an unfavourable sign especially when it is attended by much debility or a sense of sinking, or by some degree of quickness, or by a sudden stop.

177. If the rhythm, or intervals between the respirations be irregular, or of unequal duration, an unfavourable opinion may be entertained, in those diseases affecting the thoracic organs and brain, and in the far advanced period of other severe diseases, more especially if, with irregularity of rhythm, there also be inequality of the fulness, greatness, and quickness of the respiration, a great respiration following, or alternating with a small one. When the respirations are affected by spasms, or by sighing, they are exceptions to this rule. A quick respiration, or a small one suddenly cut short, or interrupted by pain, or by the increase of it, is characteristic of pleuritis, pleuro-pneumonia, diaphragmitis, peritonitis, gastritis, &c.

178. *c. The States of the Nostrils and Mouth* during respiration often indicate the issue at far advanced stages of the disease. The expansion of the nostrils or alæ nasi at each inspiration indicates a great want of pure air in the lungs, and evinces great danger in all diseases of the pulmonary apparatus. The patient often breathes entirely by the mouth in diseases of debility or exhaustion, or at an advanced stage of acute maladies, especially in dangerous diseases of the brain, and the low or typhoid forms of fever, the tongue and mouth becoming more parched by the passage of air. During respiration various morbid sounds are produced, chiefly by the posterior nares, and by the larynx and pharynx which possess some prognostic significance. *Snoring* occurs during the sleep of plethoric, or other persons even in health, when the mouth is partially open, and occasionally in disease, especially in apoplexy. A *stertorous* breathing is always morbid, and is of much more importance than snoring, which is generally produced by inspiration, stertor chiefly by expiration through the nose and is a dangerous symptom in apoplexy. Expiration entirely by the mouth, with a puffing or blowing sound, is still more dangerous in this malady.

179. *d. The Ease, Uniformity, and degree of Exertion required in respiration.*—Respiration, as respects the exertion made in its performance, may be easy, weak, strong, difficult, or strangulating. (*a.*) An *easy*, *quiet* and regular or uniform respiration, without sighing or cough, is always a favourable sign, especially in febrile affections, and always renders other symptoms, which might otherwise be considered severe, less unfavourable, especially quickness of pulse and heat of skin. —(*b.*) A *weak* respiration is characterised by the slightness of the motion of the respiratory apparatus, and by the diminished action of the respiratory muscles. It is a fatal symptom in pulmonary maladies, and in low or nervous fevers. It is chiefly in syncope or faintness, and in catalepsy, in which it is commonly the most remarkable, that it is of the least prognostic importance. — (*c.*) A *full* respiration is generally present in healthy persons during exercise, or in excited states of nervous power and of the circulation. It is present, in varying grades, in all febrile and inflammatory affections, or in disorders of excitement unattended by diseases of the respiratory organs, and it does not indicate danger, when it is uniform, easy, and without pain or difficulty. — (*d.*) A *strong* respiration is a higher grade of the last, and always is attended by some degree of exertion. It occurs in affections of the trachea and bronchi; in congestive pneumonia, in several diseases of the heart, and in the more sthenic states of fever.

180. *e. Difficult respiration,*—*Dyspnœa*—is attended by much more muscular exertion than the former, and is present in asthma, in bronchitis and pneumonia of both lungs, in effusion into the pleural cavities, in obstructive and congestive diseases of the heart and large vessels, in emphysema of the lungs, &c. In this state of breathing, certain modifications may be remarked depending upon the seat and severity of the malady. — 1st. The respiration may be *abdominal*, owing to increased action of the diaphragm, and to the consequent motions of the abdomen. This is observed in apoplexy, in certain states and forms of fever, attended by cerebral congestion and exhaustion, in pleuritis, fracture of the ribs. — 2nd. The breath-

ing may be *thoracic*, the abdomen presenting but little motion; as in inflammation of the liver, or stomach, or bowels, or of the peritoneum — of the last especially; or in ascites, or enlargement of the spleen or liver; or other changes impeding or preventing the free action of the diaphragm may be present. If the breathing be both thoracic and abdominal, great difficulty of, or obstruction to, respiration manifestly exists in the organs contained in the thorax, or in the respiratory passages. — 3d. According as certain muscles are called into action during breathing, the degree of difficulty may be determined and the severity and danger of the malady inferred.

181. The more that the action of the upper ribs co-operates in enlarging the thorax — the more high the thoracic movements are observed — the *respiratio sublimis* — the more difficult is the breathing and the more dangerous is the malady, as in hydro-thorax, the advanced states of diseases of the heart and pericardium, in bronchitis of both lungs with mucous accumulations, in congestive pneumonia, in tracheitis, &c. In the more extreme cases of this kind, but chiefly in croup, laryngitis, œdema of the glottis, &c., the muscles of the neck are also brought into action, and the muscles also of the face are often also sympathetically affected. In the maladies just now mentioned the motions of the thyroid cartilage upwards and downwards with each forced expiration and inspiration are extensive and remarkable. When the motions extend to the mouth and nostrils, in difficult respiration, the danger is extreme. The act of inspiration is most difficult, from its commencement, in the several states of croup, laryngitis, inflammation of the epiglottis, in laryngismus stridulus, and in all affections of the glottis: it is most difficult towards the termination when the disease is seated within the thoracic cavity. In some cases of difficult respiration, the patient can take a deep and full inspiration, and yet he breathes with difficulty and frequently. In these the heart or brain, or some other organ, but not the lungs, is affected. In bronchitis, in tubercular consumption, in asthma, and in emphysema of the lungs, expiration is often more difficult than inspiration.

182. In the acute diseases of the thoracic organs, the degree of dyspnœa is not always proportionate to the severity of the attack, or to the amount of organic change. But in all acute cases, a laboured respiration is always unfavourable, especially when it is continued. And, in chronic affections of these organs, a gradually increasing dyspnœa, without remission, is even still more unfavourable. Dyspnœa is always greatest when both lungs are affected; and when it is consequent upon the retrocession or disappearance of acute eruptions, especially in the exanthemata, it is always a dangerous sign. If the dyspnœa be attended by profound debility, or lividity of the lips, or gums, fingers, &c., death is near.

183. *f. The Sensations experienced during respiration* are most important. These are chiefly pain, anxiety, a sense of strangulation or suffocation, and a feeling of impending dissolution. — *Pain* is felt, chiefly during inspiration and towards the close of the act, in pneumonia, in pleuro-pneumonia, in pleuritis, &c., and at the commencement of the act in pleurodynia, acute pleurisy, peritonitis, &c. If it be experienced only when taking a full respiration, adhesions of the lungs to the costal pleura are probably present; but inflammatory action may, in those cases, exist in the lungs, or even in other organs, according to the seat of pain, when thus excited. In bronchitis, bronchial catarrhs, and influenza, the pain is often felt most, at the advanced stage, or towards the termination, of the act of expiration. *Pain* in one or other of the regions of the chest may be constant, but more or less aggravated during respiration, or it may be experienced only during this act, or not be felt unless the inspiration or expiration be full and deep. Pains about or below the collar bones, shoulders, shoulder-blades, in the back, or between the shoulders, are frequent in tubercular consumption, and may exist independently of inspiration, although often increased by it. When thus increased and experienced towards either side of the sternum or towards the angles of the ribs, or even in the back, chronic adhesions exist, or are being formed, between a portion of lung and the ribs. Pain in the sternum, not aggravated by full respiration, is often syphilitic; if aggravated or caused by respiration, especially expiration, it is produced by bronchitis, or inflammation of the mediastinum. Pain, in the cardiac region, if it be continued, but aggravated by breathing fully, or if it extends to the left shoulder and arm, may depend upon carditis, pericarditis, or endocarditis, more especially if rheumatism of some joint or part have preceded it, or accompany it. If the pain continue in the same part, it indicates acute or chronic inflammation of the subjacent structures. If the pain shift about it may be owing to hepatic congestion, or to some other biliary disorder, or to rheumatism or pleurodynia. Pain in the right shoulder, and under the right shoulder-blade, is generally caused by disease of the liver. When pain is increased by pressure it may be attributed to pleurodynia, or pleuritis, or to pericarditis. The motions of the arm and chest increase the pain of pleurodynia. A dull pain, a feeling of weight or oppression, or tension, attends pneumonia, congestion of the lungs or heart, dropsy of the thoracic cavities, and enlargements of the liver or spleen, especially when great, and in certain positions of the body. Intensity of pain is seldom proportionate to the severity of the disease of the thoracic viscera. It is generally greatest or most acute when the attack is sudden, extensive, and seated chiefly in the serous tissues. In most cases when the pain is increased, or is induced, by full respiration, there is more or less anxiety.

184. *g. Anxious* respiration is most frequent during congestive states of the lungs, heart, large blood-vessels, and brain; but more especially in diaphragmitis, pleuritis, in disease of the valves or orifices of the heart, in fatty softening of the substance of this organ; and towards the fatal termination of inflammations of the lungs, bronchi or pleura, and of thoracic dropsy. It is always an unfavourable symptom. — A *strangulating* or suffocative respiration occurs chiefly in croup, laryngitis and other affections of the larynx or trachea. — Respiration may be attended by a feeling of impending *dissolution*, especially when it is frequent, short and difficult, especially in angina pectoris, in the organic lesions of the heart, &c., in some cases of spinal paralysis, in all which it is a very unfavourable symptom. If the feeling be caused by the

accession of syncope, the prognosis is very different, unless the syncope proceed from disease of the heart.

185. *h. Other phenomena* are presented by the breathing that deserve notice.—When the respiration is healthy it is not attended by any sound, which can be heard by the ear, when removed from the chest; but in cases of difficulty, especially in the states now described, various modifications of *sound* may be heard. The sounds of inspirations and expirations become audible and even somewhat loud, during or after physical exertion, especially ascending eminences, and at the same time frequent, strong and deep. Respiration is *suspirious* or sighing, during states of mental anxiety and depression, of pulmonary, and of cardiac congestion, in cases of nervous depression or exhaustion, in hysteria and in hypochondriasis, and in hepatic or biliary congestion. Recovery from faintings, syncope, hysterical paroxysms, and from catalepsy, is attended by suspirious breathing.—A *panting* or *gasping* respiration is observed chiefly in the most extreme or dangerous cases of thoracic disease, and in the same circumstances as have been noticed in connection with the most difficult states of respiration, of which this is the most fatal. It often terminates life in cases of pneumonia or of bronchitis, or of congestion of both lungs, in the advanced states of organic disease of the heart, of hydro-thorax and hydro-pericarditis, and in diseases of the larynx and trachea. In these last, in asthma, in œdema of the glottis, and in hysterical affections of the throat and neck, the breathing is often also suffocative or strangulating, and attended by a *sibillous*, or *hissing* sound. In the spasmodic states of the larynx, as in laryngismus stridulus and hooping-cough, the sound is *crowing, loud*, and *stridulous* at each inspiration, ultimately ceasing in a short time, or becoming strangulating and suffocative, and terminating life with the usual phenomena of asphyxia.—As to the sounds of respiration in the several regions of the chest, on Auscultation, I must refer the reader to that head.

186. *i. States of the expired air in respect of temperature and odour.*—*A.* The *temperature* of the expired air is always more or less above natural in sthenic inflammations of the lungs, bronchi and pleura, during inflammatory fevers, and in the state of vascular excitement in continued and periodic fevers. It is slightly lower than in health in states of vital depression, especially in congestive affections of the thoracic organs, and in disorders of debility; and it is much lower in the last or the advanced periods of fevers, particularly the adynamic, the typhoid and the malignant, and in the asthenic forms of the exanthemata. It is lower still, being almost cold and raw, in the choleric pestilence, and in the extreme or fatal states of congestion, when the changes produced by the air on the blood cease, or nearly cease to take place.

187. *B.* The *odour* of the breath varies much. In perfect health it is sweet or pleasant; but during disorders of the digestive organs, it is foul, loaded or unpleasant. It is more or less unpleasant, in cases of dyspepsia, during flatulence and costiveness, and during the catamenia, when the odour is peculiar. It may be rendered very unpleasant by several articles even during health, as by eating onions, leeks, assafœtida, garlick, &c. The odour of the breath of those attacked by continued, exanthematous, malignant, and pestilential fevers, is most unpleasant and infectious, especially to the predisposed. In those the odour is particularly disagreeable; and the humidity of the expired air is often unusually great, and loaded with animal matter, especially at an advanced period of these maladies, as shown by breathing on a mirror or on any cold polished surface.

188. A disagreeable odour of the breath is present also in scurvy; in cancerous diseases of the stomach, mouth, uterus, &c.; in malignant sore throat; in gangrene of the lungs; in constipation of the bowels, and frequently in diarrhœa, especially in the diarrhœa precursory of pestilential cholera, and in asthenic dysentery. In this last and in chronic diarrhœa, an earthy or cadaverous odour of the breath is a most dangerous sign. In verminous complaints and in chlorosis the odour is sweetish or resembles that of new milk.—There are several other topics connected with respiration, but certain of them have received a special notice under their respective heads, as Cough, Hiccup, Voice and speech, and to those the reader is referred. It therefore only remains to consider at the place the *Expectoration* and the *Signs connected with Expectorating.*—

189. ii. The Expectoration furnishes much information as to the nature, seat and issue of disease; especially of pulmonary diseases.—It may consist —1st. of morbid mucus;—2d. of purulent mucus; —3d. of purulent mucus containing portions of tubercular matter:—4th. of pus or ichorous matter; —5th. of blood, or blood conjoined with either of the preceding;—6th. of fibrinous substances moulded in the bronchi; and 7th. of calcareous matter, or hard concretions formed in, or the remains of tubercular deposits.—In order to form a correct idea of the various matters thrown off the respiratory passages, the appearance and composition of healthy mucus from these passages should be noticed. There is, however, much difficulty in obtaining healthy mucus from these sources, as it is more or less altered from the normal state when excreted in such quantity as admits of its examination, and it is so mixed with the secretion of the bronchial glands, and so changed by the air, and the states of the air in certain localities, as to modify its condition very remarkably. The mucus of the bronchi is propelled along these canals by the ciliary motion on the surface of the mucous membrane, and by the respiratory functions. The mucus excreted is a viscid, tough and tenacious or stringy matter, which is often clear or colourless, but more frequently it is turbid, of a grayish, or faint yellowish white tint, and of semi-fluid consistence. According to Simon it consists, chemically, of a varying proportion of water and of the following constituents, namely, mucus-corpuscles, epithelium cells, mucin, small quantities of extractive matters and fat, chlorides of potassium and sodium, alkaline lactates, a little carbonate of soda and phosphate of lime, and sometimes a minute quantity of albumen.

190. *A. Morbid Mucus* is produced chiefly by catarrh, bronchorrhœa, and by bronchitis; and in these especially, as well as in several other diseases, it is often produced in great quantity, and in various states.—The quantity, as well as the appearances, of the pulmonary sputa depends much

upon the quantity of water or serum, and of albumen, with the other ingredients just mentioned. The sputa are most watery or serous in bronchorrhœa, and in congestive and œdematous affections of the lungs: they are most viscid and albuminous in the inflammatory states of the bronchi. In these states the sputa are whitish, or of a pale yellow colour, and float in water. They possess a certain degree of consistency, and feel slimy in consequence of the mucin connecting the mucus-corpuscles.

191. *B. Purulent Mucus* from the lungs contains much less mucin than normal and morbid mucus; and consequently the sputa have not the toughness, lubricity and consistence of mucus unmixed with pus; and have a decided tendency to dissolve. In bronchitis and other affections of the lungs, the transition from morbid mucus to purulent mucus is so slight, that it is hardly possible to detect the first traces of pus mingled with the mucus — or to determine the presence of a little pus in mucus, or of a little mucus in pus. Purulent mucus sinks more quickly in water, than the healthy secretion, owing partly to its containing less air, and partly owing to the greater quantity of albumen and of chlorides and higher specific gravity. Equal proportions of mucus and pus readily sink in water. A small amount of pus separates from the mucus when placed in water. Phthisical sputa, which commonly consist of purulent mucus, deposit a whitish granular sediment at the bottom of the vessel, while masses of mucus are still floating on the surface of the water.

192. *C. Purulent Mucus with softened tubercular matter* is observed in the second and third stages of phthisis. Most of the expectoration in the malady proceeds from the chronic bronchitis which accompanies it. When the sputa is placed in a glass vessel containing water, then minute portions of softened tubercle, or much larger fragments may be detected either adhering to the mucus, or sunk to the bottom of the vessel with the granular sediment consisting chiefly of the purulent portion of the excretion. These fragments of softened tubercle consist either of whitish streaks, or yellowish white masses, resembling portions of boiled rice, or of greenish white matters, of irregular shapes. (See Art. Tubercular Consumption.)

193. *D. Pus and Ichorous matter.*—*a.* Pus may proceed from three sources: — 1st. from violent inflammatory irritation of the bronchi. — 2d. from inflammation of the parenchyma of the lungs, — or 3d. from a vomica or abscess opening into the bronchi. This last is comparatively rare; and pure pus is very seldom produced by the first and second sources. Violent irritation of the respiratory passages may cause the formation of pus in place of the mucous secretion. Hence the production of pus is owing to a greater intensity of the same morbid action which, in progressive grades, produced morbid mucus and purulent mucus: — but it may be assumed that even in this highest grade a small proportion of mucus may still be present. Genuine pus is a somewhat thick fluid, viscid, but capable of separating in drops, like cream, of a whitish-yellow, yellow, or greenish-yellow colour; and of a faint animal odour. It may be slightly acid, or slightly alkaline, or even neutral. When mixed with water it soon sinks to the bottom, and on stirring it forms an emulsive fluid from which a sediment of pus-corpuscles is soon deposited. When examined under the microscope, pus appears, like mucus, to consist of a clear fluid in which small, round, and occasionally oval corpuscles are swimming, the quantity of which is in a ratio with the thickness of the pus. Pus and mucus-corpuscles closely resemble each other in form and chemical relations. Their sizes are nearly the same; but the nuclei of the former become more distinct than those of the latter when the corpuscles are treated with acetic acid.

194. The *liquor puris*, or fluid in which the corpuscles are contained, is transparent, and usually of a pale yellow colour. It contains so large an amount of albumen, that on the application of heat it becomes white, and very flocculent. The large amount of albumen, and of the chlorides, especially the chloride of sodium, associated with a small quantity of fat, distinguishes the fluid portion of pus from the consistent and adhesive fluid of mucus, and indicates the affinity between the liquor puris and lymph. The fat is chiefly contained in the pus-corpuscles, the nuclei probably containing a large proportion of it. In the liquor puris the fat is combined with alkalies.

195. It appears from the researches of Gruby, Simon, and others that pus consists of two distinct portions:— 1st, A fluid, or liquor puris:— 2nd, And of corpuscles swimming in this fluid, and insoluble in it. The corpuscles are surrounded by a capsule which becomes tumid in water, is soluble in free potash and is reduced by ammonia to a thick viscid jelly, dissolves on prolonged gentle digestion, and is doubtless composed of mucin. Of the nature of the contents of the corpuscles lying between the nucleus and the capsule nothing is known. The nucleus probably consists of albuminous matter and fat. The liquor puris contains much albumen, some fat, pyin or dissolved mucin, extractive matter and salts. In pneumonia, as the chlorides, especially the chloride of sodium, are increased in the sputa, they are diminished, or disappear in the urine.

196. An *ichorous matter* is sometimes expectorated when gangrene of a portion of the lung takes place, and in malignant growths in the lungs. It may either proceed from a decay or other change of pus, or be secreted from the gangrenous or malignant part. This matter is thin, discoloured, of a brownish or reddish tint, and emits a fetid odour. It often either contains no pus globules, or very few; and those are broken down. Although ichor is of a reddish colour, it may not contain blood corpuscles; these corpuscles having been dissolved in the morbid fluid, and having thereby imparted this colour to it. Mucus, or muco-puriform matter, may be expectorated with it in greater or less proportion, owing to the irritation of the bronchial membrane over which it passes during the process of its excretion. The presence of this matter is always indicative of great danger. Recovery may, however, take place when it proceeds from gangrene of a small or isolated portion of the lung.

197. *E.* Blood may be present in any of the states of the sputa already described. It may form, in a pure and unmixed state, the whole or the chief amount of the expectorated matter, or accompany more or less of either of the preceding kinds. It

may merely streak or dot the sputum, or be so intimately mixed with it as to give it a pinkish, reddish, rusty or brownish hue. When the blood is at all considerable, it proceeds from one or other of the sources described when treating of HÆMORRHAGE from the respiratory organs: it may be caused by interrupted circulation through the heart, or by congestion of this organ, or by congestion of the lungs and bronchi, with or without congestion of the heart, or by the irritation or congestion produced by tubercles, or by inflammatory action, or by the ulceration or erosion of vessels in tubercular cavities, or by disease of the coats of the capillaries or arterial ramifications. It was the fashion, formerly, to ascribe all hæmorrhages from mucous or villous surfaces to an exudation from the capillaries of these surfaces; but this, although a common source, especially when congestion or inflammatory irritation exists, does not always or even generally obtain, for ulceration or erosion of vessels, and disease of their coats, especially suetty or atheromatous deposits in them, favouring their rupture when congested, are not infrequent sources of hæmorrhage, especially when the discharge of blood is large or very considerable. When the bloody expectoration is small in quantity, it commonly proceeds from exudation, owing either to congestion and relaxation of the capillaries, and then it is rusty or dark-coloured, as in congestive or asthenic pneumonia, or to inflammatory irritation of the bronchi adjoining the inflamed portion of lung, and then the blood is of a more florid red, in very small quantities, and mixed with a muco-purulent matter, as in sthenic pneumonia and in tubercular consumption.

198. When blood has been expectorated in either large or small quantities, it often continues to colour the sputa for several days afterwards, the colour generally passing from a dark red to a brown, or rusty, to an ochry and greenish hue, as the quantity of colouring globules diminishes or becomes altered in the containing fluid. Extravasated blood always occasions more or less irritation in the mucous surfaces over which it passes, and hence a more copious expectoration of morbid mucus or of muco-purulent matter follows the hæmorrhage, and continues for a longer or shorter period, according to the nature of the primary and consecutive changes. When blood is present in the expectoration in a quantity merely sufficient to colour the expectoration, and is intimately mixed with it, pneumonia is certainly present, the variation of the tint from red to brown, or from a reddish brown to that of prune juice, indicating the failure of vital power. If the blood merely appears in minute streaks or spots, severe catarrh or bronchitis may only exist; but if it occur in larger spots or patches, pneumonia or phthisis is commonly present. When the spots of blood are found in a copious turbid or muco-purulent expectoration, then phthisis or very severe bronchitis exists. When they are seen in thick yellowish or greenish-yellow and rounded sputa, then pneumonia may be inferred: in these cases the prognosis is very unfavourable. A frothy, fluid and bright red blood is usually an exudation from the bronchial membrane in phthisis. Dark-coloured blood, without froth, and without muco-purulent expectoration, and in large or considerable quantity, proceeds generally from congestion, or from erosion of vessels in a tubercular cavity, or from pulmonary apoplexy. Clear fluid blood, without froth, and in large quantity, comes either from aneurisms, or from eroded or diseased vessels.

199. The bleeding may proceed from the pharynx, or even from the posterior nares, and, owing to the irritation produced by it in the glottis or epiglottis, occasion a hawking cough; but in these cases, redness is generally observed in the throat. The bleeding may be vicarious of menstruation, or of hæmorrhoids, or be consequent upon the suppression of either; and if in these cases there have been no antecedent symptoms of phthisis, the blood may proceed chiefly from the bronchial surface; but, even in these, it is often followed by, or connected with, either bronchitis or tubercular deposits. When the bloody sputa occur in fevers, and in the course of cardiac disease, the prognosis should be very unfavourable: it may be less so when bloody sputa are observed in scurvy and purpura. In all these cases numerous concomitant and antecedent circumstances should be taken into consideration.

200. *F.* Fibrinous Exudations take place, in rare cases, in chronic and in sub-acute states of bronchitis, and are moulded in the ramifications of the bronchi. They are generally expectorated in the form of the bronchial tubes, and present various extents of ramification and degrees of firmness and tenacity. These ramifications are very rarely hollow: they are commonly either filled with a softer matter, or are firmer in the more external layer. They resemble the false membranes or fibrinous exudations formed in the larynx and trachea in croup: and which are frequently thrown off in that disease accompanied with more or less gelatinous or glutinous mucus. (See Art. Bronchi, § 49. and Croup, § 33.)

201. *G.* Earthy or Calcareous Concretions are sometimes expectorated by persons who have had phthisical symptoms and recovered, or who are still suffering them in a chronic form, or have suffered in various grades for several years. I have seen many of these cases. These concretions vary in size from that of a head of a pin, to that of a small bean. Their surfaces are generally unequal, irregular and ragged. The expectoration of them may or may not be attended by much sputa, which may or may not be coloured with blood: most frequently the sputa are scanty, and are only minutely streaked or dotted with blood. A medical man called upon me, complaining that on each inspiration and expiration, but during the latter especially, there was a loud whistle, which could be heard at any distance in the room from him. He had neither cough nor expectoration; and he stated that he had not experienced either for several years. He was a fluent and eloquent speaker and lecturer, and never experienced any inconvenience from speaking for a long time; but many years ago, he had had some pulmonary symptoms. I told him that one of these concretions, of considerable size, was making its way through the parietes of one of the large bronchi, and that he would expectorate it in the course of a few days. He did so; the concretion being the size of a large pea. He is quite well at this time. A relative of my own has expectorated many of them, at different periods, the largest being the size of a small bean. She has been the subject of chronic phthisis for many years; but is now able to be about, and go out of doors.

202. *H.* The Expectoration in the several forms of disease of the Respiratory Organs has been fully described under the separate heads of Catarrh, Cough, Bronchi, the diseases of, Hæmorrhage *from the respiratory organs*, Lungs, the diseases of, Pleura, Tubercular Consumption, &c.; but it will, nevertheless, be useful to give at this place a brief *resumé* of the appearances of the sputum, in those maladies, in which it is present in increased quantity or altered quality. — (*a.*) In *dry catarrh* the sputa are scanty, and consist of small pellets of tough, greyish or greyish-yellow mucus, which are expectorated after severe fits of cough. — (*b.*) In *pituitous catarrh*, the sputa are much more abundant, and thin or watery, consisting of a serous mucus, containing albumen and mucin. This expectoration varies much in quantity and appearances, with the severity of attack, the congested state of the lungs, and with its complication with rheumatic or cardiac affections. — (*c.*) In *broncorrhœa* the expectoration is watery or serous, most abundant, and sometimes extremely so when complicated with pulmonary congestion or cardiac disease. — (*d.*) In *acute bronchitis*, little or no expectoration occurs at first: but a liquid, slightly saltish sputum is soon formed, which gradually increases with the progress of inflammation. It is at first transparent, nearly colourless, moderately viscid, retains many small air bubbles, and is frothy on the surface, especially when expectorated after much coughing. When expectorated in the same vessel, the sputa coalesce, and may be drawn into a ropy stream. The viscidity of the sputa is in proportion to the severity of the inflammation, of the fever, and of the dyspnœa. As the disease declines, the sputa become pearly, opaque, or of a yellowish or greenish white, and more consistent and glutinous. If a relapse or exacerbation takes place, the expectoration becomes thinner, more transparent, glairy, and frothy. As amendment advances, the sputa are more readily coughed up, and in more distinct pellets, which do not so readily unite into one mass as before. They gradually diminish in quantity. — (*e.*) In *chronic bronchitis* the sputa vary much in different cases, and in the same case at different periods. They are frequently similar to the sputa at an advanced period of the acute form. They are often opaque, yellowish or greenish-white, owing to an admixture of a muco-purulent matter of this hue, with mucus, and a watery or serous fluid. Sometimes the thick, opaque matter floats in the pituitous or serous fluid expectorated with it. In other cases, the mucus is inspissated, fibrinous, and moulded into the shape of the bronchial ramifications (§ 200.).

203. (*f.*) In *pneumonia*, the sputa, after the first two days, consist of a viscid, transparent fluid, tinged with an orange or rusty hue. At first they resemble the sputa of acute bronchitis, and they may be poured from one vessel into another in the form of viscid strings. At a more advanced stage, the sputa become so glutinous and viscid as not to leave the vessel even when inverted. They are, also, more streaked with blood, or red, or rusty. As the disease declines, the sputa assume the first or bronchitic appearance. In unfavourable cases, the expectoration becomes more viscous, more rusty, brown, opaque, or purulent. In some still more unfavourable cases it is altogether suppressed, owing to its viscous nature, and the want of power to throw it off; suffocation taking place, with lividity of the prolalabia and extremities. In other unfavourable cases, the expectoration assumes the form of a deep, reddish-brown and slightly viscid liquid, like the juice of preserved prunes or liquorice water. This appearance indicates the existence of suppuration, or of a cachectic state of inflammation which has gone on to softening or purulent infiltration. The characteristic sputa of pneumonia, or pleuro-pneumonia, are orange, greenish-yellow, reddish, bright-red, or streaked or dotted with red, or rust-coloured, according to the amount of red globules contained in them. — (*g.*) In *pleurisy*, the expectoration is scanty, mucous, or muco-serous, or resembles that in the different forms of catarrh.

204. (*h.*) In *phthisis*, the expectoration is varied according to the stages of the disease, and is chiefly from the bronchi during the whole course of the malady, and altogether from them during the first and second stages. In some states of phthisis little or no expectoration takes place throughout, or not until shortly before death. In the *first* stage there is either no expectoration, the cough being dry, or it is of a simple catarrhal or bronchitic character, or sero-mucous, and more or less abundant, especially when the lungs are thickly studded with tubercles, a mucous rhonchus being generally heard on auscultation. In the *second* stage, the expectoration continues as in the first, or assumes a more bronchitic character, or passes into the muco-purulent form of chronic bronchitis, until the softening and evacuation of the tubercular deposits. When the softened tubercles make their way into the bronchi, the irritation of these canals is increased, the mucous or muco-purulent expectoration is augmented, and contains whitish streaks, or whitish-yellow fragments, consisting of the softened tubercles. As the softening and formation of a cavity proceeds, the sputa assume further changes, which have been already noticed above (§ 192.), or fully described in the article on Tubercular Consumption.

205. (*i.*) The sputa are *evacuated* or *expectorated* with various degrees of ease or of difficulty, according to the nature and stage of the disease, the state of the sputa, the age and the strength of the patient. They may be hawked up, with much ease, in some cases, or coughed up, with more or less difficulty, in others. They may be expectorated and swallowed, as in children, and sometimes in adults, when they are not very abundant. The rapid, violent, and loud expiration, by which expectoration is generally effected, and cough produced, is caused by irritation existing in, or sympathetically propagated to, the larynx. *Cough* may thus be occasioned either by the irritation of sputa, when they reach the larynx, or sympathetically by disease in any part of the respiratory apparatus, or by disorders of the stomach, œsophagus, or pharynx and fauces. In the former case, expectoration follows the cough; in the latter, there is no sputum, or very little. (See Art. Cough.) The more viscous the sputum, the more difficult is the cough, especially in bronchitis; the cough often becoming suffocating or even strangulating as the sputum passes the larynx, as in croup, and the bronchitis of old persons, especially at a far advanced stage. As the strength of the patient sinks, the morbid secretion accumulates, is expec-

torated with greater difficulty, sometimes becomes more viscous, and hence still more difficult of discharge, the functions of the lungs are impeded, and ultimately arrested.

206. iii. Yawning and Sighing are nearly related phenomena, both consisting of prolonged inspirations, and both indicating nervous weariness or exhaustion; or the depression depending upon mental longings, fatigue, or approaching sleep. They are often present during the more slight states of congestion of the lungs, or heart, or large vessels; and they are generally of service in relieving these states, by accelerating the circulation, and by more fully dilating and supplying the air-cells with fresh air. They are frequently observed during the premonitory and invading stages of acute or febrile diseases, and in states of nervous exhaustion, and general debility. Whilst yawning is most frequently a sign of *ennui*, or of mental vacuity and fatigue, sighing is most commonly a sign of mental depression, melancholia, or hysteria.

207. iv. Sneezing is a reflex, spasmodic action of the respiratory muscles, consequent upon irritation or titillation of the Schneiderian membrane. It consists of a deep inspiration followed by a sudden and violent expiration, by which the air is driven out through the nose and mouth with much force and an audible noise. It is most commonly occasioned by an incipient catarrh; but it may occur from various causes of irritation implicating the nasal and respiratory passages, and as a sympathetic phenomenon in hysteria and in verminous disorders. It sometimes, when frequently repeated, precedes or ushers in an attack of apoplexy or palsy.

208. Of *Laughing* and *Weeping*, it is unnecessary to remark further, at this place, than that they are chiefly manifestations of certain opposite states of mental emotion; that they occur chiefly in susceptible, and often weak minds; and that they are characteristic phenomena of the hysterical paroxysm. They are sometimes of use, the latter especially, in moderating the emotions; laughing, by its mechanical stimulus, or its successions, transmitted to the biliary apparatus; weeping, by proving a serviceable derivation from a congested brain, or an overloaded or congested heart and large vessels.

209. VI. Symptoms and Signs connected with the Urinary and Sexual Organs. — The signs furnished by the urinary and sexual functions and organs are of the greatest importance, as respects not only the diseases of these and of related organs, but also numerous maladies of distant parts and of the whole frame. Those signs which more immediately belong to diseases of these organs, are described in the articles upon these diseases, especially in those treating of the Kidney, of Leucorrhœa, of the Ovaria, of the Urine, Urinary Bladder and Passages, of the Uterus and Vagina, and of the Vulva.

210. i. The Signs furnished by the Urinary Excretion. — The signs connected with the urinary functions divide themselves into — 1st, those which are connected with the chemical and physical states of the *Urine* itself, — and 2d, those which depend upon the modes of *excreting* the urine. The *first* of these are discussed in the article Urine, and several of both the first and *second* are directly dependent on diseases of the Urinary Organs. Both orders of signs may appertain either to diseases of these organs, or to diseases of the brain or spinal chord, or to maladies implicating the whole frame, as pestilential, malignant, or exanthematous fevers; or to disorders of the digestive, assimilative, the excreting, and the sexual organs. The great interest which thus necessarily attaches itself to states of the urine, and of the excretion of it, will become at once apparent, from the connections just enumerated. Reserving, however, the chief topics connected with these subjects for the articles just mentioned, I shall merely glance, at this place, to a few of those which are of less importance, and which are signs merely of disorders of distant organs, or of constitutional maladies. Of the states, changes, and chemical conditions of the urine, I have treated at another place (see Art. Urine): I now notice merely changes in the function of excreting it.

211. *A. The excretion of the Urine* may become difficult, painful, changed, or arrested; and the *secretion* of it may be scanty, or altogether suppressed, the excretion being similarly affected. Difficult excretion of urine may amount to what has been termed *dysuria*, in a lesser grade, and to *stranguria* in its higher grade: the former requiring much effort to empty the bladder, the latter strong efforts to discharge the urine, and chiefly by drops or small quantities. *Ischuria* has been used to express the suppression or the retention of urine — *ischuria renalis*, when none is secreted, and *ischuria ureterica*, or *vesicalis*, or *urethralis*, according to the seat of obstruction.— *a.* Dysury and stranguary may proceed — 1st, from diseases of the urinary organs and passages: — 2d, from the conditions of the urine itself, or from the presence of a calculus or calculi in the bladder or urinary passages: — and 3d, from disease of either adjoining or distant viscera, as in cases of dysentery, of hepatic or splenic disease, or of uterine or ovarian lesions. Neither dysury nor stranguary should be viewed as devoid of risk, whenever observed. If either occur in aged persons, or in those who have previously experienced disease of the urinary organs or passages, a most minute examination should be instituted to ascertain the nature and seat of lesion, from which alone the amount of risk or danger should be inferred.

212. *b. Ischuria* may more correctly be divided into that of *suppression*, and that of *retention*. The *suppression* or non-secretion of urine is caused 1st, by inflammation or structural changes of the kidneys themselves: — 2d, by congestions, inflammations, or other alterations occurring in the course of exanthematous or other fevers, or pestilences: — 3d, by organic or other maladies of the brain, spinal marrow, or their membranes. In all these circumstances, the ischuria is a most dangerous sign, inasmuch as it consists of the suppression of a function by which the principal part of the injurious, effete, and irritating materials accumulating in the blood is eliminated and discharged; the arrest of the function being necessarily followed by very manifest alterations of the blood, by an uncommon excrementitious plethora, and by effusions in shut cavities and cellular parts, by coma and death, unless restoration of the excretion take place before these results have reached an irremediable extent. The *ischuria suppressionis*, in the three classes of disease in which it occurs, is nearly equally dangerous; as respects the general results, it is least so in inflammation or congestion of the kidneys; it is most dangerous, or commonly

fatal, in diseases of the brain and spinal chord, and it is not much less dangerous when it occurs as a complication of exanthematous or other fevers or pestilences. In scarlet fever, the kidneys are often asthenically inflamed or congested to an extent incompatible with the performance of their functions, the excrementitious matters and fluid which should be excreted by them thereby accumulating in the blood. In pestilential cholera, the ischuria is a consequence of the excremential fluid of the blood being all discharged by the digestive canal and skin, none being left that can be removed by the kidneys; other excremential matters, however, accumulating in the blood, owing to the suppression of the renal function, and consecutively inducing secondary fever and fatal complications.

213. *c. Ischuria retentionis* — the ischuria of retention, or of obstruction, — may take place either in consequence of an obstruction at the outlet of the pelvis of one or both kidneys, or in the course of the ureter, by a calculus, tumour, or any other lesion, or by inflammation, suppuration, &c., implicating either or both these. In all these cases the urine may be secreted, may accumulate in the pelvis of the kidneys or ureters above the seat of obstruction, and none may reach the bladder. But the *ischuria of retention* most frequently occurs in consequence, 1st, of *paralysis* of the coats of the bladder, consequent upon disease or injury of the brain, spinal chord, or their membranes; or of congestion of the nervous centres and paralysis of the bladder, in the course of typhus or low fevers; — and 2d, of *obstruction* to the discharge of urine from the bladder, sometimes caused by spasm, but more frequently by disease near to, or in the neck of, the bladder or urethra, as diseased prostate, impermeable stricture, the impaction of a calculus, &c. In all these circumstances ischuria is attended by more or less danger, but the amount of danger altogether depends upon the exact nature and seat of lesion, in respect of the urinary passages, upon the age and sex of the patient, and the progress and duration of the pathological lesion by which the ischuria is caused.

214. *d.* Ischuria may occur, however, in hysterical females — *Ischuria Hysterica* — and may depend upon either congestion of the spinal chord, and paralysis of the bladder, or upon spasm of the cervix vesicæ; most probably upon the former. Several cases of this form of ischuria have come under my notice, in which the urine required to be drawn off, twice or thrice daily, yet complete recovery has ultimately taken place. It is generally caused by masturbation, and is sometimes feigned.

215. *B. Inability to retain the Urine — Incontinentia Urinæ — Enuresis*, occurs in various forms. It may follow ischuria, or may take place even in connection with over-distension of the bladder; the coats of this viscus having been so over-distended as to have lost the power of contraction and of evacuation. In this case, there is a constant dribbling of the urine. In such cases the prognosis is unfavourable, and especially in aged persons. The incontinence may proceed from the state of the urine itself, especially when, owing to disease of the kidneys, it contains either blood or albumen: but this form consists rather of frequent calls to pass urine, the quantity being small, than of absolute incontinence. Very frequent calls to micturate occur in most inflammatory diseases of the urinary organs, and more especially in those affecting the bladder. In such cases, these calls take place as soon as a spoonful accumulates in this receptacle. This incontinence may also proceed from ulceration of the inner surface of the bladder, or from disease of the neck of the viscus, or from calculi, or clots of blood, or from foreign bodies, in the bladder, or from paralysis of the neck of the bladder. The paralytic state is most frequent in aged persons, in those who have previously suffered diseases of the urinary organs, as a consequence of strangury or ischuria, or of disease of the spinal chord or its membranes, and as a complication of typhus or of low fevers; in all which circumstances it is a very dangerous symptom.

216. *C. Frequent calls* to pass urine, more or less being passed on each occasion, sometimes occur in nervous persons, especially during states of mental anxiety or expectation; and in hysterical females. In many instances, the quantity of pale urine passed on one, or on several occasions, in connection with hysteria, is often surprising. In these, this symptom need not create much anxiety; but in all cases of frequent calls to micturate, especially during night, the urine ought to be tested, in order to ascertain the presence of albumen, or other substances, in it. Whenever this complaint occurs, the state of the urinary organs and the habits require attention, and should be ascertained in connection with the physical state, the quantity, and the chemical condition of the urine itself, and with the functions of the digestive and circulating organs.

217. *D. An external examination of the abdomen* should always follow the recognition of the symptoms and signs connected with the urinary organs and urine. Percussion will aid in ascertaining the existence of enlargement of the kidney, or of distension of the bladder. Increased size of the kidney, or the accumulation of fluid in the pelvis of the organ, may be inferred, when, with marked dulness on percussion, there is also a fulness or tumour felt, whilst the region between the lower ribs and margin of the ilium is pressed forwards, the thumb being gently moved or pressed anteriorly. But the bowels ought to have been freely evacuated before this examination can be confided in. The *sensibility* of the region of the kidney, during this, or any other examination, affords information of great importance in determining the existence of disease of the kidney, especially inflammation and the existence of calculi in the ducts or pelvis of the organ. The ureter may be so distended in ischuria ureterica, or when a calculus is impacted in its lower extremity, as to be felt like a rope in, or closely above the inguinal region.

218. A dull sound on percussion, immediately over the pubis, indicates fulness of the bladder. Pain in this situation is a sign of over-distension; and pain behind or below the pubis is a symptom of inflammation or ulceration of the bladder, or of its cervix, and of stone in the bladder. Disease of the prostate is best ascertained by examination per anum. The existence of stricture, or stone in the bladder, &c. should be ascertained by the sound, by the catheter, bougies, &c. (*See also the Articles* Diabetes, Kidneys — *diseases of*, Prostate, Urine, and Urinary Bladder.)

219. ii. Signs and Symptoms of the Sexual

Organs.—*A. These symptoms in the Male* have not, generally, received that amount of attention which they require, as respects the states of the constitution, the diseases of particular organs, and especially those of the brain and spinal chord. The lesions to which male organs are primarily and locally liable, have been ably discussed by modern surgical and medical writers: it is chiefly as to the manner in which these organs are affected, sympathetically, in the course of other maladies, that a brief notice will be taken of them at this place. In health, the testes and penis are well developed, and the scrotum is more or less contracted; the cremaster muscles evincing sufficient tone to draw the testes close to the penis. In rare instances, one or even both testes may not have descended into the scrotum, and may have been arrested in some part of their course from the abdomen to the scrotum.

220. In *diseases* of vital depression or exhaustion, especially in fevers, in diseases of the digestive organs, and particularly of the stomach and intestines, the dartos and scrotum are no longer corrugated, the cremasters are incapable of contraction, and the testes hang down unusually low. In nephritis, and in calculus or other diseases of the kidney, the cremaster of the same side as that in which the kidney is affected is contracted, the testis drawn up close to the penis, or even to the external abdominal ring; and a darting or aching pain often is felt in the testis of that side, or extends along the chord. In those diseases in which the cremaster and scrotum are so remarkably relaxed, as just stated, the venereal desire is for the time extinguished; but with convalescence from them, especially from fevers, a restoration of the contraction of these parts, and of the sexual desire, is one of the most certain signs of recovery, as evincing a return of nervous power in both the organic and spinal nervous systems.

221. Inordinate relaxation of the cremasters and scrotum, often with more or less wasting of the testes, and sometimes with both softness and wasting, takes place in those who have prematurely or inordinately exercised their genital organs or been guilty of self-pollution. By these persons the venereal congress can no longer be either satisfactorily or fruitfully exercised. The seminal fluid is neither sufficiently nor healthily secreted, the organs being rendered incapable of discharging their functions. Hence Impotence, and one of the causes of Sterility. (*See those Articles.*) Persons who have thus destroyed their sexual functions, or who have greatly weakened them, and those who have been accustomed to sexual intercourse and who have relinquished such intercourse, are often subject to involuntary discharges during sleep, and are thereby more or less exhausted. When these involuntary pollutions are complained of, it may generally be inferred, that the individual had prematurely or inordinately addicted himself to sexual excesses, or to self-pollutions, and that having become aware of the injury they had produced, and abstained from them, the debility and morbid irritability thereby occasioned still persisting, the sympathetic excitement of a venereal dream proved sufficient to produce a seminal discharge. (See Art. Pollution.)

222. The sexual organs having been so exhausted by premature, or excessive, or unnatural use, as to give rise to impotency, and the feeling of incompetence having taken possession of an individual's mind, so as to prevent him from entering upon the married state, or from exercising these organs, the disuse actually increases the wasting, softening, or decay of these organs, and, with such decay, constitutional vigour, or vital energy, becomes impaired. A very large proportion of bachelors are actually impotent after 30 or 35 years of age, and, being conscious of their prematurely exhausted powers, prudently abstain from sacrificing the happiness of the opposite sex. All are not, however, so prudent, for some marry from various motives, although capable only of exciting a desire which they cannot gratify. Owing to the cause now noticed, the duration of life amongst bachelors is considerably less than amongst married men.

223. Loss or increase of sexual desire depending thus, 1st, upon the states of the organs concerned in the performance of the sexual functions, 2d, upon the activity or excitement of those sources of nervous energy actuating these organs, and, 3d, upon the general condition of the body, it follows, that either loss or increase of this desire becomes a symptom of disease in one or other of these quarters. It has just now been shown, that the organs destined to the performance of the sexual function may be exhausted, or altogether worn out, or disorganised, by premature or excessive use, or subsequent disease. Nevertheless the desire may exist, although performance is most imperfect, or even impossible. When this is the case, excitement is present in the sources of nervous power actuating these organs, either in the nervous centres at the origins of the nerves supplying these organs, or in the mind acting upon these centres, although these organs themselves may be incapable of discharging their offices. The excitement may be mental only — a mere passing or temporary feeling — but it may be more permanent, or even remarkable and uncontrollable; and, in this case, there is always reason to infer the existence of irritation or inflammatory action in those parts of the nervous centres — ganglial, cerebral, or spinal — most intimately related to the nerves supplying these organs. Diseases implicating the whole frame, as fevers, &c., are rarely attended by increased sexual desire, unless during convalescence from them. On the contrary, this desire is altogether abolished during their duration, whilst at the same time the sexual organs are collapsed, the testes dependant, and the scrotum flaccid and disposed to erythematous inflammation and excoriations. In acute, inflammatory, and febrile diseases, the sexual functions and desires are either impaired or abolished at their commencement, and during their continuance. In diabetes, in severe influenza, general debility, in some diseases of the brain, and in all acute maladies of the digestive canal, the sexual desire is lost.

224. The sexual desires and powers are seldom very remarkably impaired in chronic diseases of the lungs and heart, especially in tubercular consumption, and particularly in the more chronic and non-febrile states of this malady, in which they even may continue almost to the last. The same may be said of diseases of the ovaria and uterus, and, in a less degree, of chronic affections of the liver, spleen, and kidneys. Too frequent erec-

importance to the individual himself, as well as to those connected with him, than has usually been considered; and, although imputed solely to the male sex, the same affection, produced chiefly by similar causes, and characterised by nearly similar symptoms, is not infrequently also observed in the female. In the former sex it is generally *caused* by premature or excessive sexual excitement, or by consequent involuntary pollutions; in the latter it is also occasioned by the same causes, and by prolonged leucorrhœa commonly consequent upon self-pollution.

4. i. *The symptoms* in both sexes are chiefly extreme emaciation, a weak and bent state of the spinal column; the lumbar region of the spine having lost its posterior concavity, and having become either straight or convex, owing to the softened yielding or atrophied state of the intervertebral substance. The gait is unsteady and vacillating; the knees bend under the weight of the body; and all the muscular movements and mental manifestations evince debility, exhaustion, impaired powers of exertion, application and attention. The genitals are often flaccid, wasted, or soft and small, in the male; and are subject to leucorrhœa in the female; the eyes are sunk, and the whole body is emaciated. If the causes are continued, various functional and organic lesions supervene, especially nervous affections, varying in character with the peculiarities and circumstances of individual cases, hysteria, hypochondriasis, mental depression or delusion, tremors, extreme susceptibility, anæmia, and ultimately epilepsy, incomplete or complete, partial or general paralysis, insanity, and the several other consecutive maladies mentioned when treating of voluntary and involuntary Pollutions.

5. ii. *The Prognosis* in Tabes dorsalis entirely depends upon the changes which the spinal chord has undergone, and upon the secondary affections which have appeared. The nature of the changes, however, which may have taken place in the chord, can be inferred with but a slight degree of certainty; for the chord may be partially softened, or it may be atrophied, or indurated, or both wasted and indurated; and the fluid existing between the spinal membranes may be increased, or the venous sinuses of the spine may be remarkably congested. The prognosis will greatly depend, not only upon the progress of the disease, but also upon the continuance of its principal cause; for, too frequently, the vice in which it has originated is persisted in, notwithstanding the conviction of the miseries which result. Although the disease may not be cured, or even much relieved, life may be prolonged for a considerable period.

6. iii. *Treatment.*—The means which have been recommended for Debility, Impotency, and for Pollutions, voluntary and involuntary, are altogether appropriate to this complaint, which commonly, as just stated, proceeds from the same causes as these. But unless the cause be relinquished, the means of cure may be most judiciously resorted to without avail. Of these means, chalybeate mineral waters, and preparations, change of air, and residence in a dry and temperate air, frictions and stimulating embrocations along the spine; the iodide of iron taken in the syrup of sarza; the preparations of cinchona, of gentian, of valerian, of sumbul, &c., are the most beneficial, aided by suitable diet, exercise and regimen.

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TETANUS and TRISMUS.

— Synon. — Τέτανος (from τείνω, I stretch), Auct. Græc.;— *Tetanus*, Pliny, Vogel, Swediaur, Sauvages, Cullen, &c.; — *Tonos Trismus*, Parr; — *Entonia rigida*, Young; — *Entasia Tetanus*, Good; — *Catochus*, Auct.; — *Tetanos*, Fr.; — *Todtenkrampf*, *Starrkrampf*, Germ.; — *Tetano*, Ital.;—*Tetanus Erectus, vel T. Proprius*; — *Tetanus, Tetany.—Tonic or Entonic Spasm.*

Tetanus Emprosthotonos, — ἐμπροσθότονος — from ἔμπροσθεν, forwards, and τείνω, I stretch — when the body is bent forwards.—*Tetanus Anticus*, Good; — Tetanic Procurvation.

Tetanus Opisthotonos, — ὀπισθότονος, — from ὄπισθεν, backwards, &c., when the body is bent backwards. — *Tetanus Dorsalis*, Good; Tetanic Recurvation.

Pleurosthotonos—from πλευροσθεν, sidewards, πλευρὸν, the side, &c., when the body is bent laterally. — *Tetanus lateralis*, Sauvages.

Trismus, — τρισμὸς, — from τρίζω, I gnash — when the muscles of the jaws are chiefly or solely affected. — *Entasia Trismus*, Good; — locked-jaw.

Classif. — 4th. *Class*: Nervous Diseases — 3d. *Order*: Spasmodic Affections (*Cullen*). — iv. *Class*: Dis. of the Nervous Function. — iii. *Order*: Affecting the Muscles, (*Good*).—II. Class. III. Order (*Author in Preface*).

1. Definit.—*A tonic state of Spasm — or entonic Spasm, extending to many or to most of the muscles of animal life, or voluntary motion — with exacerbations, and usually without any period of complete relaxation, until the subsidence of the malady; its progress being generally acute or sub-acute, and often most rapid, and then terminating life by asphyxia.*

2. The *Pathology* and *Treatment* of Tetanus and Trismus have been subjects of discussion with both medical and surgical writers during many years; and even the most experienced and the ablest writers have confessed their inability to furnish satisfactory information respecting them. As tetanus is most frequently a consequence of surgical operations, and of external injuries, in temperate climates, physicians are not often called to its treatment. Nevertheless it behoves them, as much as surgeons, to be acquainted with all that

is known of both the nature and the treatment of this malady. Although it, as well as trismus, is most frequently symptomatic, yet it occasionally appears primarily or idiopathically — rarely in this climate, but not infrequently in hot climates, especially in the dark races.

3. According to its *severity* and *duration*, tetanus has been divided into *acute* and *chronic*; but in neither point of view can it be considered to be, in any case, a chronic disease. If any such division be adopted, the *acute* and *sub-acute* states may be assigned to it; but this division is altogether arbitrary; as no line of demarcation can be drawn between them. *Primary* or *idiopathic tetanus* is either acute or sub-acute, is often less violent than the symptomatic, and is less dangerous, especially in temperate climates. The *symptomatic* or *traumatic tetanus* is commonly acute and is a most dangerous malady. Besides the divisions now noticed, certain forms have been described, which are characterised by peculiar symptoms, which are merely manifestations of the disease in greater severity, or to a more limited extent in some muscles than in others. The partial state of the disease, *trismus*, is that in which the more general forms commence; the forms usually recognised being *trismus*, *pleurosthotonos*, *emprosthotonos*, *opisthotonos*, and *tetanus erectus*; but two or more of those forms may appear in the progress of the same case, according as the morbid action of the muscles extends or predominates in one set of muscles over the others.

4. I. DESCRIPTION.—The *symptoms* of tetanus, in all their forms, are very readily recognised; but not until those characteristic of the malady appear. Those which are *premonitory* of the attack, or which occur in the period which elapses between the cause and the declared disease, have not been satisfactorily observed. It cannot be supposed that this period is without any premonition of the impending malady. I have remarked uneasiness or pain at the epigastrium, and about the throat; much lassitude, with restlessness and depression of spirits; chilliness or cold chills, especially in the idiopathic; uneasiness and anxiety at the præcordia; twitchings of the muscles of the injured limb, in some cases of the traumatic form; and obstinate constipation in every form of the disease. These symptoms may be of short duration, or they may be experienced for a considerable time: they are followed by pain under or below the sternum, often extending backwards to the spine, by more or less difficulty of swallowing; by pain and stiffness of the neck, &c. To these are generally soon added all the other symptoms which characterise the more partial or limited form of the disease, namely rigidity, pain or contraction of the muscles of the lower jaw.

5. *a. Trismus* may be viewed as the commencement of all the forms of tetanus. With, or following, the pain under the sternum and difficulty of swallowing, the patient complains of uneasiness or stiffness of the muscles of the jaws, neck and throat, and pain in the course of the cervical region of the spine. To these succeed a difficulty in opening the jaws, in masticating or swallowing food, and in rotating or even in moving the head. The muscles which raise the lower jaw assume a state of contraction or tonic spasm, so that the teeth are kept in constant contact (*locked-jaw*). This symptom is first indicated when the patient is desired to show his tongue, and soon is followed by more or less spasm of all the muscles of the face. The angles of the mouth are retracted, the alæ nasi are elevated and the nostrils expanded; the eyes are fixed and prominent, the brows and forehead drawn and wrinkled, the countenance presenting an anxious or distressed expression. In children, or rather in young infants, the disease may not proceed further, as respects the tetanic affection of the muscles, and yet it may terminate fatally, more or less rapidly, either in convulsions or in asphyxia. This limitation, and this course of the malady, are very rare in adults, the state of trismus generally advancing quickly to those about to be mentioned.

6. *b. Pleurosthotonos*, or *tetanus lateralis*, is a predominant spasm of the muscles of one side, drawing the body to that side. This form very seldom occurs. It commences with trismus, or with the affection of the muscles of the face and neck, and often passes into one or other of the forms about to be noticed. The lateral curvature is not always considerable, for it is produced rather by a greater severity of the spasms in one side, than by any limitation of them to that side. I have observed the form in a child, in an idiopathic form, death occurring during a violent convulsion from asphyxia.

7. *c. Emprosthotonos* is the predominant contraction of the muscles of the anterior aspect of the trunk, by which the body is bent forwards, and the head is drawn to the sternum. This state is rarely observed during the whole course of the malady. It may occur for a short time, and be followed by either opisthotonos or tetanus erectus. It, as well as the other forms of the disease, commences with trismus, which in it, as in the others, continues throughout.

8. *d. Opisthotonos* is the bending backwards of the trunk by the excessive action of the muscles of the posterior parts of the neck, back and loins. This is the most frequent form of the disease. The numerous strong extensor muscles of the spine overcome the action of the flexor muscles of the abdomen, and produce a rigid curvature, or posterior concavity, the body resting, during the exacerbations, upon the occiput and heels only; the jaws being also forcibly closed, and the abdominal muscles contracted. This form may be followed by, or may alternate with, the next, the *tetanus proprius*.

9. *e. Tetanus*, although designating any of the forms of the disease attended by general spasm, and being the generic appellation, is often intended to convey the idea of a state of the disease, in which the body is stretched out by the spasms, without being very manifestly bent in any direction — *tetanus erectus*, not *tetanus proprius*. It may follow, in the progress of the malady, either of the states already noticed, presenting at intervals the form of opisthotonos, the posture assumed by the trunk depending upon a momentary or temporary predominance of action of certain muscles or series of muscles; or it may appear in this form consecutively upon the premonitory symptoms, and the partial affection of the face and neck, and preserve it throughout.

10. *A.* ACUTE TETANUS. — This common form of the disease may be either symptomatic or idiopathic. It may result from propagated irritation, and present no satisfactory evidence of inflamma-

tion of the membranes or substance of the spinal medulla; or irritation may superinduce inflammatory action, with the usual symptoms, or even be attended by such symptoms from the commencement, especially in the idiopathic form (See PATHOLOGICAL INFERENCES, &c., §§ 61, *et seq.*)—*a.* After a more or less evident manifestation of premonitory symptoms (§§ 4, 5.), contractions, generally persistent, commence in the muscles of the face and neck — the stage of *trismus.* These contractions extend downwards to the muscles of the back and trunk, and often also to those of the limbs; and the disease assumes either of the forms now stated, but most frequently the two last specified. The jaws generally continue firmly closed; and, although the contraction of the muscles of voluntary motion — of both the trunk and limbs — or the rigidity of these muscles, remains uninterrupted, violent paroxysms or exacerbations of the contraction recur after short intervals, or after from five, to fifteen minutes, and are attended by extreme pain and distress. As the disease advances, the exacerbations become more violent or prolonged; the body is bathed in a warm perspiration; the pain at the præcordium is increased; respiration is laboured, embarrassed, or hurried; and the pulse becomes very rapid and often irregular. The exacerbations are induced by the slightest causes — by a current of air, by attempts to move or to swallow, or by unpleasant sounds, or by a strong glare of light.

11. As the disease continues, the voice becomes altered, harsh, and disagreeable; the larynx is raised upwards, and the tongue is often forced against the teeth during the exacerbations, and lacerated. The shoulders are drawn forward, and the body is either extended or forced into the other positions already noticed, according as the action of one set of muscles predominates over their antagonists. The sense of tightness and the pain under the sternum and ensiform cartilage continue to extend to the spine, and are attended by a laboured, quick, and difficult respiration, and by an agonising feeling of suffocation. The muscles of the face are strongly contracted, whilst the countenance is pale or livid, and bathed in perspiration. The patient expresses the most distressing sufferings, both from pain, and from the difficult respiration, particularly during the exacerbations, which are more frequent, prolonged, and violent as the malady advances, the respiratory muscles, and even the diaphragm, ultimately becoming more or less affected. Owing to this extension of the spasm the patient is carried off by asphyxia, especially in the more acute or rapid traumatic cases; but in the more sub-acute and idiopathic cases, when the disease has been of much longer duration, the severity of the symptoms often abates previously to death, and the patient sinks apparently from exhaustion, but even in these a recurrence, or an extension of spasm, to the respiratory muscles sometimes terminates life.

12. *b.* Such is the usual course of this malady, but each case presents certain modifications of the symptoms during its progress. The earliest or the most constant precursory symptom is obstinate constipation, and this generally continues throughout the disease. The pain at the epigastrium, and anxiety under the sternum, and at the præcordium are the next, and these are very prominent, equally persistent, and generally extend to the spine. Inability to swallow is owing to spasmodic action of the muscles of the tongue and pharynx, and probably also of the œsophagus, often implicating also the glottis, attempts to swallow liquids being often followed by their forcible rejection through the nose and mouth. This state of spasm is such as prevents the introduction of a flexible tube down the œsophagus from one of the nostrils. The difficulty of defæcation, owing to the spasm of the sphincter ani, increases the constipation; and a similar difficulty attends micturition, the urine being sometimes retained, or forcibly ejected by the spasm of the abdominal muscles. The spasms of the muscles of the face occasion remarkable distortion of the features, young persons often presenting the appearance of age. Respiration is chiefly affected during the exacerbations. It is then catching, difficult, and painful; the pain extending from the ensiform cartilage and præcordium to the spine, or darting in the direction of the diaphragm, and being most probably occasioned by spasm of this muscle. The pain in this situation, at an advanced period of the disease, is different from that experienced under the sternum at the commencement. The spasmodic contraction of the muscles is attended by more or less suffering; but this is said not always to be the case. The exceptions are certainly rare; for I have never seen an instance to the contrary, although the distress has been much less in some cases than in others, and experienced only during the paroxysms.

13. The greatest diversity is presented by the extent and severity of the spasms, and by the state of the pulse, in different cases. Whilst in some the muscles of the face and neck, and particularly the muscles closing the jaws, are chiefly or solely attacked (*Trismus*), those of the trunk and limbs being but slightly or not at all contracted; in others, the muscles of the face are much less affected, whilst those of the trunk and limbs are severely attacked. Mr. CURLING, in his excellent work, remarks, that the muscles of the eye are sometimes, but not generally affected. When this occurs, the eye-ball is fixed and drawn slightly inwards, the patient being unable to direct it towards particular objects. Most frequently, however, these muscles are free, the eyelids being half-closed, the contractions of the orbicularis palpebrarum, in this case, being unopposed by spasm of the levator palpebræ. The pupil of the eye has been said to be contracted in tetanus, by some writers, and to be dilated by others. I believe it to be generally contracted; but that it may become dilated with the supervention of the cerebral congestion connected with incipient asphyxia. The muscles of the extremities are less frequently, or less severely, affected than those of the face, neck, and trunk; the forearms and hands being generally the least affected, but much depends upon the seat and nature of the injury, of which the disease is the effect; for the spasms sometimes commence, or are most violent, in the injured limb. When the disease has followed amputation, the spasms of the muscles of the stump and limb are often most distressing. The spasms being thus more or less general and severe, as respects the voluntary muscles, and ultimately extending to the sphincters, and to the

respiratory muscles in the more acute cases, the violent and continued spasms of these latter muscles generally terminating life in these cases, it may be inquired — 1st, whether or no the spasms extend also to involuntary muscles; and, 2d, whether sleep has any influence in relaxing them?

14. 1st. It has been supposed by Currie, Parry, Howship, Travers and others, that death, in tetanus, is caused by the extension of spasm to the heart. But, with Mr. Curling, I doubt the existence of spasm of this organ, even as a termination of the disease. There can be no doubt that the inordinate actions of the voluntary muscles occasion a quick return of blood to the right side of the heart at the accession of the paroxysms, and rapidity as well as irregularity of the action of this organ; but any degree of spasm of it would be incompatible with the continuance of life. But, although spasm of the heart is not present in the course of the malady, it may occur and terminate life; and Mr. Howship has adduced a case, in which he believed, from the state of the heart observed after death, that spasm of this organ was the cause of death. The examination, in this instance, was made eleven hours after death, at which time the body is generally still warm, and the heart firmly contracted. In two most acute traumatic cases, which I examined after death, the heart did not present any appearances different from those observed in cases of sudden or rapid death from other causes. Both these cases terminated in asphyxia. Mr. Curling refers to a case for which amputation was performed by Mr. Liston, and in which the vessels contracted so much that there was no hæmorrhage, and ligatures on the mouths of the divided vessels became unnecessary. I am not acquainted with any similar case. The contraction certainly could not have existed to any considerable extent previously to death, otherwise the circulation could not have gone on; the phenomenon being produced by the increased irritability of the coats of the arteries and by their constriction on exposure to the air. It was supposed by Dr. Cullen and others, that the constipation always observed previously to the accession, and during the course, of the disease is owing to spasm of the muscular coats of the digestive canal; but there is no pain or other symptom referrible to this quarter suggestive of spasm, obstinate constipation generally attending all severe maladies of the nervous centres of animal life, as shown when treating of diseases of the Brain and Spinal Chord.

15. 2nd. Sleep rarely occurs in acute traumatic tetanus, and only during a few minutes, or in the intervals between the exacerbations, or when the continued contractions in these intervals are not attended by much pain. In the sub acute cases, however, sleep is more frequent, and a more complete relaxation of the muscular contractions takes place; but upon being awakened the full tension of the muscles returns. This circumstance shows the influence of loss of consciousness upon the morbid irritability of these cases, and throws some light upon the pathology of the disease (see §§ 61. *et seq.*). During recovery, and in the less severe cases, and when the intervals between the paroxysms are considerable, sleep may ensue, and the spasms be relaxed, especially as then the effects of the narcotics, so frequently prescribed for the disease, begin to be manifested.

16. *c.* The *pulse* in tetanus has been variously described by different authors. This has been owing chiefly to the different states of the heart's action in the several stages or states of the disease, and the varying grades of frequency in the acute and sub-acute cases, as well as in the idiopathic and symptomatic forms of the malady. Dr. Morrison, Hennen, Macgregor, and others have remarked, that the pulse is seldom much affected; but the greater number of writers have stated the pulse to be very much accelerated, and most remarkably so in acute cases. This is the result of my own observation in the numerous cases which I have had an opportunity of observing in France and Germany, in 1815 and 1816, and subsequently in warm climates. In an acute case, which I attended in 1820, the pulse was 120 in the minute in the first day of the developed attack. The patient died on the third day. The pulse is generally much less frequent during the intervals than in the paroxysms; but the degree of frequency varies in different cases, as well as in the course of the disease. The treatment adopted has often a considerable influence in quickening the pulse, and towards a fatal issue this is especially the case. The changes taking place in the spinal chord, medulla, &c., and their membranes, according to their nature and amount, also influence the pulse. As the powers of life sink, or are depressed by sedative agents, as by tobacco injections, &c., the pulse becomes remarkably quick, and often feeble. Both the pulse and the respiration are greatly accelerated by the spasms, and hence are varied in character and in quickness with their severity and frequency of accession. During their continuance, especially towards the close of the malady, the pulse is often so frequent, weak, and irregular as not to admit of being accurately counted, whilst the respiration is laboured or gasping.

17. *d.* The *surface* of the body is much warmer than natural, is bathed in perspiration, and is often morbidly sensitive to external agents. The amount of animal heat necessarily varies in different cases — probably from 100° to 106° of Faht. M. Prévost, of Geneva, has stated it to have been much higher (110°), in a case under his care. Dr. Bright says that it was 105° on the third day of the disease. I observed it 105½° in the axilla, on the second day of a case which terminated fatally on the fourth day; and 106° in another which died on the third day. The perspiration is most copious during the exacerbations, and generally has a pungent and peculiar smell. Larrey supposed it to be critical; but Mr. Curling justly considers this not to be the case. I have seen it the most abundant in the most rapidly fatal cases. A miliary eruption sometimes accompanies excessive perspiration and heat of the skin. The cutaneous sensibility is unusually great, especially to the slighter causes of sensation, as to a light touch, to cold air, &c., and in this the disease resembles the sensitiveness of the surface in Rabies, and in inflammation of the spinal membranes (see Spinal Chord, § 135.).

18. *e.* The *urine* is generally in small quantity in tetanus, as may be supposed from the excessive perspiration, and it is usually high-coloured. It is more abundant in the sub-acute form of the

malady. The bowels are always constipated, and are moved with great difficulty; the stools, however, present no very remarkable disorder, beyond what is usual from retention. The tongue is commonly white and moist at the commencement; but it is often dry, with the papillæ erect as the disease advances, and thirst becomes urgent. When tetanus or trismus is fully developed, the tongue can seldom be satisfactorily shown.

19. *f.* The *senses* are acute during the course of the disease, especially sight, hearing, and touch, and are remarkably susceptible of their respective stimuli. The functions of the *mind* are unimpaired, even during the most distressing exacerbations, and any degree of delirium is rarely observed until shortly before dissolution, and then it may sometimes have been occasioned by the narcotics which had been prescribed.

20. *g.* The state of the *blood* has not been satisfactorily observed, either in the idiopathic or symptomatic form of the disease. I have seen it without any particular change in one case, and both cupped and buffed in another; and slightly cupped only, in two; but one of these cases was only once accidentally seen by me. The question is, whether or no this state of the blood is connected with, or a manifestation of, inflammatory action in the animal nervous centres, or merely the consequence of the inordinate muscular action; but this involves the consideration of the pathology of the disease. Admitting that there is inflammatory action of these centres, or at least of their envelopes, in some cases, as there undoubtedly is in the idiopathic states of the malady, there must necessarily be some degree of fever; and this state of the frame is said not to exist in traumatic tetanus. Mr. CURLING observes that this form of the malady "is generally unattended by fever; and Dr. CULLEN, Dr. CLEPHANE, and Dr. CHALMERS, and many other authors have remarked that the blood very rarely possesses an inflammatory character." Mr. O'BEIRNE states that he witnessed about two hundred cases of tetanus; but he never saw one accompanied with fever. It may certainly be admitted, that, in the traumatic form of the disease, fever is not often observed at its commencement, and that the febrile symptoms enumerated above, especially the quick pulse and respiration, the hot skin, the copious perspiration, thirst, and excited papillæ of the tongue, are chiefly the consequences of the violence of the muscular contractions; yet, in many cases, these symptoms (if not febrile, what are they?) are partly to be imputed to increased vascular action — an action excited by the irritation propagated to the spinal chord and medulla oblongata, and thence reflected upon the voluntary muscles, the inordinate action of these muslces developing increased vascular determination to the origins of the spinal nerves, and to the spinal chord; this determination, advancing to morbid action, perpetuating the muscular contractions, extending their spheres, and ultimately terminating in very many instances, by implicating the respiratory muscles, even the muscles of the glottis as well as those of the pharynx.

21. *B.* SUB-ACUTE AND OTHER STATES OF TETANUS. — When an attack of either idiopathic or symptomatic tetanus is less severe than that described above, especially during the second and third days, or when its severity is partially subdued, it may continue in a sub-acute or milder form for several days, or even for three, four, or five weeks. This state of the disease has been usually termed *chronic;* but it hardly can be called so, as respects either the character or duration of the disease. In this less acute or milder form the symptoms are nearly the same as in the acute, especially at an early period, but they either are, or become, less severe. The intervals between the paroxysms are longer, and the paroxysms are shorter, or the spasms are milder. The pulse also is either less frequent or but little accelerated during the intervals, and the contractions are less general or continued than in the acute form. The symptoms thus gradually subside, and the natural functions assume their healthy states. But the muscles continue for some time stiff or sore; and they are liable to a return of stiffness or contraction after exposures to either cold, wet, or miasmatous exhalations.

22. *The sub-acute or mild form* of tetanus may present an intermittent character, especially when it is idiopathic, owing to the concurring influence of malaria with wet and cold in causing the attack; but this modification of the disease is only met with in warm climates and in miasmatous localities. In females, trismus, or sub-acute tetanus, may assume an *hysterical character*, or hysterical symptoms may be associated with the tetanic, the disease being really tetanus, and occasioned by an injury. Of this association I had a very remarkable instance, many years ago, in a cook in my own family. This state of the disease should be distinguished from hysteria, when the latter assumes a tetanic form, owing to the violence of the spasms during the hysteric paroxysm (See DIAGNOSIS, § 35.).

23. But tetanic symptoms may be produced in females by the usual causes of tetanus, especially during the catamenia, or after an abortion, or after parturition, especially if any portion of the ovum, or membranes, or placenta be retained. In these there is sometimes much of the hysterical character, but the tetanic may so predominate as to place the patient's life in jeopardy. Of this I saw a case to which I was called in consultation some years ago. I was convinced of the retention of a portion of the ovum. A decoction of secale cornutum with the biborate of soda was prescribed, terebinthinate enemata were administered, and terebinthinate embrocations applied along the spine. The cause of irritation was discharged from the uterus, and the patient recovered.

24. *C.* TERMINATIONS.—A *fatal issue* is most commonly occasioned as now stated. In this case, the paroxysms become more severe and prolonged, and the pulse most frequent, feeble, and irregular. Respiration is difficult, hurried, laborious, and unequal. The motions of the chest and of the diaphragm are impeded; and the lips, face, and surface become first pallid and then livid. The lungs are congested, and air ceases to be either inhaled or expelled. It has been supposed that, during the paroxysm, asphyxia may be occasioned by spasmodic closure of the glottis, the spasms extending to this quarter chiefly or only; and that death is thus suddenly produced during the exacerbation; and it has also been inferred that spasmodic closure of the glottis is superadded to

spasm of the muscles of the chest and diaphragm. Whether either mode takes place solely, or both co-operate, in occasioning the fatal result, is a matter not easily determined; but it is of some importance that it should be ascertained, as indicating an extreme measure of treatment in imminent circumstances. Whilst death is thus generally occasioned in the acute cases, it is imputed chiefly to exhaustion, in the sub-acute, or chronic as commonly termed; the prolonged disease, the inability to receive nutriment, the return of spasms, and the consequent exhaustion and inanition terminating life. But, even in these, spasm may affect the muscles of respiration, or even the glottis, and produce death. When exhaustion or inanition occasions this termination, the paroxysms become weaker and less frequent; the pulse small, weak, irregular or intermittent; the muscles relax; the features sink; the eyes are dim, or are covered by a slight film; and respiration is gasping, slow or laboured, or it gradually and almost insensibly ceases.

25. Recovery from tetanus is commonly gradual. In a table where Mr. Curling has arranged 128 cases of traumatic tetanus, fifty-eight terminated successfully: eight being cured in the course of a week; three in ten days; four in a fortnight; four at the end of three weeks; fifteen at the end of a month; four after five weeks; eight after six weeks; three at the end of eight weeks; three after two months; and in two after three months. The muscles often continue stiff for some weeks after the spasms have subsided, owing to the injury received by them during the attack. Even months may elapse before they regain their healthy tone and action. In a case recorded by Dr. Currie, the patient's features retained "the indelible impression of the disease." And, in a case by Mr. Curling, the patient complained of stiffness about the jaws when exposed to cold, although nine months had elapsed from the attack; and, in another case, rigidity of the muscles of the lower jaws continued for six months after recovery. A few days before this was written I was consulted by a gentleman, whose jaws had continued so firmly locked, after an attack of idopathic trismus, that some of the front teeth had been extracted to enable him to receive food into his mouth. This contraction of the muscles of the jaws had continued nine years, without any change. He had become accustomed to it, and he now consulted me for a different ailment. The treatment of these effects of tetanus is a matter of importance, as will appear in the sequel.

26. *The duration of tetanus* varies very remarkably, both in the idiopathic and symptomatic forms. This is well shown, as respects the latter form, by the table compiled by Mr. Curling. Professor Robison has stated that a negro having scratched his thumb with a broken piece of china, was seized with tetanus, and died in a quarter of an hour. In one case, the patient died in twelve hours; in another, recorded by Mr. Dickinson, death took place in twenty-two hours; and, in a case contained in Mr. Curling's table, in twenty hours. In another, fully detailed by this excellent writer, death occurred sixteen hours after the first appearance of tetanic symptoms, and six days after the injury. This termination is frequent at various periods from twenty-four to forty-eight hours. In the table just mentioned, fifty-three cases were fatal within eight days after the appearance of symptoms: eleven on the following day; fifteen on the second day; eight on the third; seven on the fourth; three on the fifth; four on the sixth; three on the seventh; and two on the eighth day after the commencement of the disease, but very few after a longer period. Morgagni mentions a case which was fatal after twenty days. Dr. Lionel Chalmers, in his account of acute idiopathic tetanus in South Carolina, assigns the duration of this form of the disease nearly to that of the traumatic form now quoted from Mr. Curling. Dr. L. Chalmers states that patients generally die in twenty-four, thirty-six, or forty-eight hours, and very rarely survive the third day; but, when the disease is less acute, that few are lost after the ninth or eleventh day.

27. *D.* Appearances in Fatal Cases.—Different changes have been observed in different cases, and those which have been found in some have been absent in others. Certain changes are, however, more constant, and are rarely altogether absent.—*a.* The *body* generally is unusually rigid after death; and the *muscles* are not only firm or contracted, but they also present, in many places, rupture of their fibres and ecchymoses.* The *blood* is always uncoagulated, and hence it gravitates to the more depending parts, and gives those parts externally a livid or dark mottled hue. The combination of rigidity of the muscles with fluidity of the blood shows that the *rigor mortis* is not the result of the coagulation of the blood in the structures; this state of the muscles being evidently owing to the morbidly increased irritability before dissolution, the remains of which still continue in their fibres for some time after death.

28. *b.* The *nerves* immediately connected with the seat of injury, are stated by some writers to have been injured, inflamed, or otherwise changed; and by others to have been in no ways affected. Even when presenting manifest appearances of inflammation, they have been viewed as merely participating in a similar state of the surrounding parts. In some cases, however, the inflammatory changes have not been confined to the portions of the nerves in the seat of injury; but have been traced in different parts of their course as far as their origins. Many recent observers have traced these changes along the nerves to the pia mater, the arachnoid, and the substance of the spinal chord, which have usually also presented evidence of inflammatory action. Some instances have occurred to these and other observers (see Bibliog. and Refer.), in which injury of the nerve has existed, or causes of irritation have been in contact with the nerve, without signs of inflammatory action. As respects the nerves, therefore, the

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* Mr. Bowman (*Philos. Transact.*, 1841, p. 69.) has found some muscles in tetanus apparently healthy, whilst others presented a pale appearance in many parts, like the muscles of fish, arising probably to the blood having been squeezed out of the vessels. In other parts they had almost lost their fine filamentous structure, and presented a soft spotted mass which was easily torn. Extensive ecchymoses were frequent, and contrasted with the pallor of other parts. Under the microscope, the primitive fasciculi exhibited, here and there, the characteristic signs of extreme contraction, fusiform swelling, and a closer approximation of the transverse striæ than usual. In other parts, these fasciculi were reduced in size, and the striæ were either far apart, or had disappeared entirely. In many parts they had burst with the sheath.

proofs of change, although evident in many instances, are wanting in others; but it is by no means certain that, although changes perceptible to the unaided senses have been wanting, no change has existed, or that irritation of a most violent kind may not have been propagated along the nerves without developing inflammation, or changes usually termed inflammatory, sufficiently great or manifest to remain many hours after death.

29. *c. The ganglia and sympathetic nerves* were suggested by me, in a paper published in the *London Medical Repository* for May, 1822, to be the seat or pathological cause of tetanus, and especially of the idiopathic form of the malady. I then contended, that the ganglial, or the organic nervous system, is the source of irritability in contractile tissues; and when this property is inordinately excited, without the control of the will, that changes should be looked for in this system. Some years subsequently, Mr. SWAN directed attention to the sympathetic system in tetanus, and stated that the ganglia were preternaturally injected in this disease; and appearances said to support this statement were observed by ANDRAL, ARONSSOHN, and DUPUY; whilst MEYER, VETTER, and others, have adduced instances of tetanus consequent upon ossific deposits irritating branches of ganglial nerves. It should not, however, be overlooked, that the ganglia are often very vascular, even in health; that they are not always, or even generally, unusually or excessively vascular, and much less manifestly inflamed, in tetanus; and, even granting them to be excessively injected or inflamed, it cannot be shown that their inflammation could be more productive of tetanus, than a state of irritation or of vascular erythism, this latter condition being manifestly more compatible with excessive discharge of function, than a state of inflammation.

30. *d. The Spinal Chord, Medulla Oblongata, Brain, and their Membranes*, have frequently presented changes more or less decidedly morbid, in tetanus and trismus. I believe that these changes are rarely altogether absent, especially as respects the spinal chord, medulla oblongata, the pons Varolii, and their membranes, when the inspection is made within twenty-four hours after death, and when these parts are carefully examined. Something, however, should be imputed, as respects both the presence and the absence of change, to the fluidity of the blood after death, and to the position of the body. In no inspection which I have witnessed, have inflammatory appearances in one or other of these parts been altogether wanting. These appearances have been viewed as the pathological cause of tetanus by the FRANKS, LARREY, MAGENDIE, BRERA, RECAMIER, REID, KENNEDY, OLLIVIER, CASTLEY, and many others, whose writings are referred to in the BIBLIOGRAPHY; and when tetanus or trismus has been present, and these changes have been slight or absent, the circumstance may be explained without inferring that these parts were either unaffected or unchanged, even in their vascular conditions during life (see §§ 63, *et seq.*). The changes more commonly observed are, vascular injection of the pia mater, sometimes with exudations of lymph on its free surface; hardening or softening of one or more of the columns of the chord or of the medulla oblongata, softening being more frequently observed when the inspection has been long delayed; opacity of the arachnoid, or deposits of small plates of bone or of cartilage in the free arachnoid, the surface of these plates being rough on the sides next to the pia mater; generally increased vascularity, sometimes with recent adhesions, and congestion of the veins and veinous sinuses of the spine. These changes may extend more or less generally along the chord and medulla oblongata, often also to the pons Varolii, and even to parts in the vicinity of the latter, and surrounding the fourth ventricle. They were thus observed, with several ossific plates in the arachnoid, in an acute case of tetanus which was under my care in 1820, and of these appearances I made a coloured drawing, which is still in my possession.

31. In addition to these, the substance of the chord and medulla is somewhat reddened or injected, and exhibits numerous red points when divided. In some cases, the membranes are more decidedly inflamed and thickened. Generally, the spinal fluid is abundant and somewhat altered or turbid. In rarer instances, a puriform exudation is found between the membranes, and the softening of a portion of the chord presents a puriform infiltration with capillary injection. In still rarer cases, the serous exudation is of a rose colour, or even more deeply tinged, or even blood is extravasated and extended along a considerable part of the chord. These are the chief changes which are observed in the spinal medulla in fatal cases of tetanus; but nearly all the appearances described when treating of *inflammation of the membranes and substance of the* SPINAL CHORD and MEDULLA OBLONGATA, are sometimes found in cases of tetanus and trismus, especially in the idiopathic form; whilst in some cases, more particularly of the traumatic form, no changes in the spinal chord, medulla oblongata, or their membranes, or in the ganglial nerves, or even in any other part, have been detected; but, whether the examination in these instances has been sufficiently minute or not, may be viewed, in the present state of our knowledge, as somewhat doubtful.

32. The morbid appearances which have been constant in the cases which I have inspected, chiefly, however, many years ago, were, injection of the membranes and substance of the more central parts of the base of the brain — the medulla oblongata, the pons Varolii, and parietes of the fourth ventricle. Numerous cases illustrative of the pathology of tetanus have been detailed by Mr. CURLING; and to his work, as well as to others, and to many interesting papers referred to in the BIBLIOGRAPHY, I refer the reader.

33. The changes which have been found in these parts of the animal nervous system admit of more than one interpretation, and manifestly supervene in two ways:—1st. They may be induced primarily, especially in idiopathic tetanus, the seat and extent of the inflammatory action along the medulla oblongata and chord, occasioning the extended and the continued contractions, and the spasmodic exacerbations.—2nd. They may be merely consequences of the irritation conveyed to the spinal medulla and membranes, or to the medulla oblongata, or parts in its vicinity, by nerves proceeding from the periphery of the frame, or by communicating nerves from internal ganglia

or viscera: the irritation, thus extended and reflected by motory nerves on the voluntary muscles, excites increased vascular action; and this increased action in many instances advances to inflammation, or to the production of changes, either resembling, or identical with those said to be inflammatory. (See *Pathological Inferences*, &c. §§ 61, *et seq.*).

34. *e.* In addition to the above, changes have been found in other parts of the body. The *lungs* are usually congested, and the blood in the vessels is dark and fluid, owing to the immediate cause of death — the state of asphyxia. Increased vascularity or inflammatory injection of the digestive *mucous surface* has also been seen by M'Arthur, Swan, Andral, and others; but this change may also have resulted from the asphyxia, or from the medicines prescribed. Injection of the *ganglia* has been remarked by Swan, myself, and others; but this, if it at all exceed the natural state, may be only the result of propagated or transmitted irritation. The existence of *worms* in the intestines and stomach in a very large proportion of cases, of both the idiopathic and symptomatic malady, especially the former, is interesting, at least as a predisposing cause; and instances of this fact have been recorded by Mursinna, O'Bierne, Larrey, Laurent, Dazille, Thompson, Morgagni, Stoll, and many others; and great importance has been attached to them as a cause of tetanus by these writers. "The papillæ maximæ at the root of the tongue are sometimes found hypertrophied, and the mucous lining of the *larynx* highly injected, and containing a quantity of frothy mucus." (Curling.) — The *pharynx* and upper portion of the œsophagus are much contracted, and their internal surface is red and inflamed, and often covered with a viscid reddish mucus. Similar appearances are also found in cases of Rabies (see § 22.). In both maladies the spasms of the pharynx explain the changes of these parts.

35. II. Diagnosis. — Tetanus can hardly be mistaken for any other malady. — *a.* The continued contraction of the muscles of the jaws and face; the peculiar pain under the sternum; and the exacerbations of the continued muscular contractions, viewed in connection with the cause, when this is known, sufficiently indicate the malady. — *b.* It may, however, when superficially viewed, be mistaken for *rabies* (or hydrophobia, as that malady has improperly been termed), owing to the difficulty of swallowing fluids, to the accession of spasms of the muscles of the face and neck upon attempts to swallow, and to the increased sensibility. But the entire absence of muscular contraction during the intervals between the paroxysms, and the morbid impulse and ferocity characterising the rabid paroxysms, distinctly mark that disease, and distinguish it most satisfactorily from tetanus.

36. *c.* Tetanus can hardly be distinguished from *inflammation of the membranes of the spinal chord and medulla oblongata*, especially idiopathic tetanus. Indeed this latter, and even the symptomatic, may be viewed as often being very acute forms of inflammation attacking almost simultaneously the arachnoid and pia mater of the chord and medulla oblongata, and occurring either primarily or consecutively of irritation propagated to these parts (§ 33.); the extent of the morbid action occasioning a co-ordinate extent of muscular contraction. When treating of meningitis of the chord, and of myelitis (see Spinal Chord, §§ 127—157.), I described the symptoms, as respects the voluntary muscles, as being identical with tetanus or trismus, according to the seat and extent of disease of the spinal membranes. Inflammation attacking either these membranes, or the chord, or the medulla oblongata, or extending to them all, will necessarily be followed by effects, as respects the muscles especially, varying with the changes produced in these structures by the inflammatory irritation or action, of which they are either successively or co-etaneously the seats. For, if the morbid vascular action in these tissues be not followed by either effusion of lymph, or softening of the chord so as to occasion abolition of function (paralysis), it must necessarily follow, that the increased muscular action, produced by the vascular action in the membranes of the chord, will be continued either until the vascular action subsides or is subdued by treatment, or until it extends to the membranes or substance of the medulla oblongata and central parts of the base of the brain, and occasions spasm of the respiratory muscles and asphyxia. In many cases the inflammatory action in the membranes or substance of the spinal chord is limited to a portion only of either, or of both, and the consequent changes are such as occasion paralysis, the tetanic contractions described, in the article referred to, being partial and co-ordinate with the extent of disease in the chord, and either preceding the paralysis, or co-existing with paralysis, but in a different series of muscles. Instead, therefore, of viewing tetanus and trismus, especially in their idiopathic forms, as totally different diseases from inflammation of the membranes of the spinal chord and medulla oblongata, I consider them very closely allied, although not identical maladies, the chief differences arising from the extent to which these membranes are affected, from the development of muscular irritability being greater in the one disease than in the other, and from the changes consequent upon the irritation or inflammatory action of which they are the seats.

37. *d.* It ought not to be overlooked that *Hysteria*, especially in its more paroxysmal and spasmodic form, may very closely simulate one or other of the forms of tetanus. Of this I have observed several very remarkable cases; the closeness of resemblance being such as would have induced a physician, who had seen the case for the first time, to believe that the patient was actually the subject of tetanus. Generally, however, these hysterical tetanic seizures are preceded and attended by so many hysterical phenomena that the difficulty of diagnosis is slight. But this is not always the case; for the trismus, or the more general tetanic contractions, may be so protracted, and the symptoms of either opisthotonos, or emprosthotonos, be so complete, as to lead to the conclusion, which the observation of some cases has confirmed, that the irritation of the sexual nerves has so excited the spinal chord or membranes, or the origins of the spinal nerves, as to develope a tetanic state, owing to the reflection of this irritation, from the chord and origins of the voluntary nerves, upon the muscles of voluntary motion. The nature of these hystero-tetanic seizures, even when prolonged, may be inferred from the sex and age of

the patient, from the history of the case, from co-existing hysterical symptoms, and from the rapid effect produced by influences acting strongly on the mind, or powerfully exciting volition, as preparations to apply the actual cautery, or the cold affusion. It may further be mentioned, that cases may occur (I have seen three undoubted instances) of simulated trismus or tetanus in hysterical females, especially in those who addicted themselves to self-pollution. The test just mentioned will often aid in the detection of these cases, and often present the recurrence of the hysterical form of trismus or tetanus. The trismus, or more fully developed tetanus, occurring in rare instances after parturition or abortion, is often attended by hysterical symptoms, and hence requires close attention to distinguish it from some states of hysteria; the alliance in such cases being close. Although *epilepsy* is attended both by trismus and tetanic spasms, yet the characteristic unconsciousness of the former sufficiently distinguish it from the latter.

38. III. Tetanus Infantum.—Synon. *Tetanus vel Trismus Nascentium ; Tet. vel Tris. Neonatorum ; Tet. or Tris. of new-born Infants.* — *The Tetanus* or *Trismus* of recently born infants is essentially the same disease as that already described. It generally commences in the first seven or nine days after birth, and rarely later than the fourteenth day. The muscles of the lower jaw are first affected, hence it has been frequently named trismus; but the spasms are rarely limited to these, but commonly extend to the other muscles of the face, and to those of the neck, trunk, and also of the limbs. Even when the spasms are apparently confined to the muscles of the jaws, a paroxysm of more general spasm suddenly occurs and terminates life by asphyxia. The tetanus of infants usually presents two forms, as in the tetanus of adults, but is even more rapid in its progress than the latter — the *acute*, which commonly terminates life in ten or thirty hours, or within forty-eight hours; the *sub-acute*, which may be prolonged to eight or nine days, but more frequently terminates from the third to the fourth or fifth. Recovery from either of its forms is very rare.

39. This malady is now very rarely observed in temperate climates, and formerly not frequently, unless in Lying-in-Hospitals, in which it has appeared as a most fatal endemic. According to Dr. Joseph Clarke, it proved fatal to many of the infants born in the Dublin Lying-in-Hospital. At the conclusion of 1782, of 17,650 born alive in that institution, 2944, or about 17 per cent., had died of it within the first fortnight from birth. But it is chiefly among the dark races, and the negro slaves especially, that it is most frequently met with. Mr. Maxwell, Dr. Hancock, Dr. Morrison, and others state that it is a chief cause of depopulation in the negro races in the West India Isles, and in the colonies of Demerara and Essequibo, the deaths of new-born infants from this malady being about cent. per cent. of all that are born. According also to Rush, Fourcroy, Valentin, Dazille, Campet, and others, it is also a frequent, and always a fatal. disease in the southern or slave states of the United States, but that it is rarely seen in white infants. According to Dr. Holland and Sir Geo. Mackenzie, it is destructive to all the infants born in the island of Haimacy, on the south coast of Iceland, and it exists in St. Kilda, the most remote of the western islands of Scotland; this prevalence being imputed chiefly to the food given to infants.

40. *The causes* of this disease of infants have been very differently assigned by writers. By some it has been imputed to the division of the umbilical chord, and by the subsequent treatment, and hence it has been viewed as traumatic tetanus in the infant; by others it has been considered as idiopathic, and caused chiefly by a vitiated atmosphere, from crowding and deficient ventilation; and by many it is said to be owing to the retained meconium, and to morbid secretions in the primæ via; whilst not a few impute its frequent occurrence in the West Indies to the excessive use of irritating purgatives soon after birth. All these causes have been disputed, and exposure to cold, or currents of air, has been assigned as its chief agent. That more causes than one are concerned in producing it seems most probable, and, in connection with the division of the umbilical chord, an impure air, currents of cold air, unwholesome and inappropriate nutriment, and irritation of the digestive canal either by morbid secretions and excretions, or by unsuitable purgatives, may concur in developing the malady, in those constitutionally predisposed to it, as negro infants appear to be, especially in some localities. That a contaminated atmosphere is concerned in causing the malady in white infants is shown by the fact, that the very remarkable fatality occasioned by it in the Dublin Lying-in Hospital, and noticed above (§ 39.), was reduced, after the date there stated, from seventeen per cent. to five per cent. by a better ventilation of the institution.

41. *The appearances in fatal cases* have been very differently described. But, although nearly every case has been fatal, and numerous opportunities of inspection have been furnished, still the changes produced by the malady have been very imperfectly observed. Until early in the present century the spinal chord and parts in the vicinity of the fourth ventricle were rarely or never examined, even in this and other forms of tetanus; and as various concomitant or contingent changes were remarked by writers in different tissues and organs, so these changes severally received the credit of directly or pathologically producing the disease. Various changes of an inflammatory kind have been observed in parts in the vicinity of the umbilicus; whilst several of these changes have been considered such as necessarily follow the division of the chord. Dr. Goelis of Vienna was among the first to examine with attention, although preceded by the Franks, the spinal chord and medulla oblongata, in the cases which occurred in the foundling hospital of that city; and he, as well as others subsequently, has always observed increased vascularity of the membranes and substance of those parts of the animal nervous centres. Indeed, according to my own observations in a few instances, and to those of other writers who have always inspected these parts, not only in cases of trismus and tetanus, but also in fatal cases of epilepsy and convulsions, morbid appearances, either congestive or inflammatory, and often also their usual consequences, have been observed in these situations, and in the more central parts of the base of the brain, and hence

we have no reason to infer that the pathology of the tetanus of new-born infants is in any material respect different from that of the tetanus of adults, the only difference being in the greater severity, acuteness, and fatality of the former; and as far as my own observation has extended, in the more marked inflammatory appearances, or the extremely increased capillary injection of the nervous centres of both organic and animal life.

42. IV. RELATIONS AND ALLIANCES OF TETANUS AND TRISMUS TO OTHER DISEASES.—i. Certain of these *Relations* have been already noticed when noticing the *Diagnosis* of Tetanus and Trismus, but there are others which should not be overlooked, especially as they serve to throw light on the nature and treatment of this malady. When treating of inflammation of the membranes of the BRAIN and of the SPINAL CHORD, I stated that spasm, more or less constant or persistent, is present in the muscles supplied with nerves, the origins of which are more immediately connected with the inflamed part, and that the spasm continues until pressure or disorganization, at the origins of these nerves, destroys their functions. When irritation is propagated from remote or distant parts to the membranes of the cerebro-spinal system, the effect produced may be longer persistent, than when inflammation is primarily developed in these membranes; for, in the former case, the irritation may continue long before inflammation is developed, whilst, in the latter, the primary existence of inflammation may be more rapidly followed by exudation, thickening, and other inflammatory changes calculated to impair or destroy the functions of their seats and of adjoining parts. Hence in most cases of spasm, convulsive disease, and tetanus, the nature and rapidity of the fatal result depend either upon the extension of the irritation to parts intimately connected with the origins of nerves supplying vital parts, or to the inflammation and consequent changes at or near the origins of these nerves.

43. *A.* In *cerebral* or *spinal Meningitis* there is generally spasm of muscles supplied by nerves, the origins of which are allied to the irritated or inflamed portion of membrane; and, when the membranes of the basilar parts of the brain are affected, the spasms are the more general and severe or fatal. In the convulsive or spasmodic affections of infants or children, the great difficulty often is to determine whether the attack proceeds from disease existing primarily in the brain or its membranes, or from irritation and consecutive morbid action propagated thither from distant or remote parts; and even when the latter is most evidently the case, it is not the less difficult to decide how far the propagated irritation may have affected the membranes or substance of those parts of the cerebro-spinal centre to which it had extended. The spasmodic attacks of infants and children, whether tetanic or convulsive — whether persistent or momentary — generally depend upon certain pathological conditions, which are usually simple, or unassociated at their commencement, but which are not infrequently complicated in their advanced progress. These conditions may be — 1st. Irritation or vascular erythism in, or implicating, the more central parts of the base of the brain, or of the membranes.—2d. A similar state affecting some portion of the spinal medulla.—3d. Inflammatory action, at an early period of its progress, or before the consequent organic changes have abolished the functions of the nerves proceeding from the seat of morbid action in either the brain, or spinal chord, or their membranes. — 4th. Irritation primarily affecting some portion of the digestive canal, and propagated thence to either the chord, or brain, or their membranes.—5th. Irritation existing in the gums, or in other parts more or less remote and similarly propagated. — 6th. Morbid states of the blood, arising either from the absorption of morbid matters, or of poisonous articles, or from self-contamination, consequent upon the failure or arrest of some depurating function, and affecting the substance or membranes of the cerebro-spinal centre.

44. It will follow, from a due consideration of the usual procession of morbid action, that the disorder, whether denominated irritation, erythism, morbidly exalted nervous function, &c., commencing originally in either the *fourth* or *fifth seats* — in either the digestive canal or other parts—will frequently, and after various periods, superinduce either the *first*, *second*, or *third* of these pathological conditions, or all of them in succession; and whilst they, severally or singly, are attended by spasm, more or less persistent or momentary — tetanic or convulsive, continued or paroxysmal — the great difficulty which the physician will have to contend with, is to decide respecting the origin and seat of disorder and the progress it has made, conformably with the procession of morbid actions now demonstrated. To ascertain these points with due precison, also, the remote causes, the more immediate effects of these causes, and the whole history and progress of each case require accurate examination; and the functions of parts deriving nerves from the several sources already indicated should be duly investigated. The accession, the progress, and termination of each attack — paroxysmal or more or less persistent—ought to be carefully and closely observed, in respect—1st. Of the functions of ingestion, digestion, and defæcation.—2nd. Of respiration, circulation, and vascular action. — 3rd. Of the functions of sense, and of altered sensibility. — 4th. Of cerebral manifestations and consciousness.

45. When there is, in connection with spasmodic or tetanic action, increased sensibility of the surface of the body, the membranes of the spinal medulla are obviously implicated. If with these symptoms there be also a morbid exaltation of the senses of hearing, seeing, &c., the extension of irritation or of inflammatory action to the basilar parts of the brain may be suspected. If the spasm be accompanied with anæsthesia of the surface, either consecutively upon increased sensibility, or primarily, or with impairment or loss of the functions of sense, the presence or supervention of congestion, or of effusion, or of softening, in those parts of the nervous centres, upon states of irritation, erythism, or inflammatory action, may be inferred; the extent and seat of spasm, and of impaired or lost sensation, indicating the seat and extent of the pathological condition. If in connection with, or consecutively upon, spasmodic contractions, there be loss of all consciousness — of all the functions of sense, and all the manifestations of mind — as in epilepsy, and in puerperal and some other forms of convul-

sion, &c., it may be inferred, that the irritation, whether cerebral, spinal, or in parts remote from these centres, so affects the medulla oblongata or the central parts of the base of the brain as to occasion spasm of the respiratory muscles, especially of the glottis and diaphragm, or to paralyse or arrest their functions, either for a time or fatally; if for a time only, the cerebral congestion attending the paroxysm and the imperfectly oxydised blood serve to dissolve the spasm by paralysing for a brief period the previously irritated nerves, a return of the normal state of the functions ultimately resulting; if fatally, the protracted spasm and the consequent congestion and asphyxia terminate existence.

46. The views now stated explain the alliance of tetanus or trismus with the spasms or convulsions of infants and children, as well as of adults; for, as long as the parts of the base of the brain, which are more intimately connected with conscious sensibility, are not implicated in such a manner as to abolish their functions either for a time or for ever, the attack is simply spasmodic or convulsive, consciousness and mental manifestation being unimpaired. When, however, the powers of mind and consciousness are affected, the extension of disease to the brain, or the primary affection of some part of this organ, is made manifest, and the attack is either epileptic or apoplectic, according to its mode of accession or to the phenomena attending and following it.

47. *B.* In *Epilepsy* and in the *epileptic convulsions of the puerperal states*, there are present not only the spasms of the muscles of the neck and face, but also most of the other phenomena of tetanus, in either of the forms already defined, often modified, but sometimes almost identical with them, although generally of a short or paroxysmal duration. The chief distinction, however, is in the sudden accession of unconsciousness which is generally contemporaneous with, or somewhat antecedent to, the spasm. In all cases of spasm or convulsion, accompanied with unconsciousness, the muscles of respiration are early affected, and cerebral congestion and imperfect oxygenation of the blood result, these conditions tending to dissolve the spasms, and thereby to admit of the return of a normal state of respiration, if they are not so excessive or persistent as to destroy life.

48. *C.* In *Apoplexy*, and more especially in that form which was first described by me under the name of *convulsive apoplexy*, tetanic rigidity of muscles, more particularly of those of the neck or limbs, with various convulsive movements, is more or less manifest. Although in these cases the vessels of the brain are very frequently diseased, and the substance of the brain consecutively altered, with hæmorrhagic clots, yet the spasms, tetanic contractions, and convulsive movements are not to be imputed so much to these and other allied alterations in the substance of the brain, as to changes in the membranes, especially in those parts which cover the central and basilar parts of the cerebrum.

49. *D.* The tetanic spasms and convulsions observed in the more violent *paroxysms of Hysteria* are seldom accompanied with unconsciousness; or, if they be so attended, the loss of sensation is incomplete, and supervenes gradually, whereas it is instantaneous and complete in the fully developed fit of epilepsy; and it comes on gradually or suddenly, or is incomplete or complete in convulsive apoplexy, the contractions of the muscles being either very extended or limited in either malady. The chief differences in the spasmodic or muscular contractions, characterising these diseases and the several forms of trismus and tetanus, are that they are either subordinate phenomena, or of comparatively short duration in the former, whilst they constitute the characteristic feature, the most dangerous symptom, and the cause of death, in the latter.

50. *E.* In the tetanic contractions characterising the *convulsions of infants and children*, especially the form termed *eclampsia*, there is generally more or less affection, primary or propagated, of the cerebro-spinal centres, or of their membranes. If the brain be unaffected, the functions of sense and consciousness are not materially disturbed during the attack; but if these functions be manifestly impaired or lost, the mischief is in the brain or its membranes, or is propagated thither either along the spinal chord or its membranes, or directly from the seat of irritation, by means of the ganglial or sympathetic nerves. In young children and infants, when the irritation is in the stomach, or in the bowels, or in the gums, it is often difficult to determine whether the muscular contractions are attended by loss of consciousness or insensibility. In many cases they are not thus associated, as evinced by the senses of sight and hearing, by the sensibility of the surface, and by the free and unembarrassed cry; this last more especially indicating, that the function of respiration is unaffected. In other cases, even when the irritation is seated in one or other of these parts, the cerebro-spinal centres may not be implicated at first, but they may become affected sooner or later, and be the chief seat of disease, as commonly observed in other convulsive maladies attacking either children or adults. (See arts. Convulsions, §§ 22, *et seq.*, and Spasm.)

51. ii. The Effects of Muscular Contractions on the Circulation have not received sufficient attention from pathologists. It is manifest that the changes produced on the circulation by muscular contraction, inordinate either in degree or in continuance, will vary with these conditions, and with the muscles affected. The provisions so wisely made as to the return of blood from the brain and spinal chord: the sinuses within the cranium, and the venous sinuses of the spinal column are so arranged, as very greatly to diminish or to counteract the ill effects of arrest of the return of blood from these organs; nevertheless more or less obstruction to the return of blood from them is produced by violent or protracted spasm, chiefly by pressing upon venous trunks, or by interrupting the passage of air into the lungs, or by preventing the relaxation, or by continuing the contractions, of those muscles, upon the alternate relaxation and contractions of which respiration depends. In these cases, the right auricle of the heart becomes over distended, the return of blood from the brain impeded, the liver becomes congested, and the circulation through the lungs insufficient for the oxygenation of the blood; asphyxia and cerebral congestion being the ultimate results.

52. iii. The Influence of the Blood on Muscular Contraction is even greater than that of muscular action on the circulation. Ac-

cording to the states of the blood circulating through muscular parts, the contractions of these structures may be exalted, spasmodically excited, or weakened, or even altogether abolished. Much of these states is doubtless owing to the influence of the blood upon the nervous centres, from which the affected muscles derive their nerves; but it is not unreasonable to infer, that a highly oxygenated state of the blood will impart tone directly to the muscular fibre, that an opposite state of the blood will impair the tone of this fibre, and that the accumulation of acid, acrid or irritating elements or materials in the blood, occasioned by interrupted excretion or otherwise, will sometimes cause not only exalted or morbid contractions of muscular parts, but also irritation and vascular excitement of the substance and membranes of the nervous centres. If the vascular excitement go on to the usual condition and consequences of inflammatory action, these changes will rarely be limited, although more manifest in one part than in another, for the exciting pathological cause is general, being present in the blood, and implicates both the nervous structures and their membranes; whereas the more common exciting causes of inflammation chiefly act locally, and affect a portion only of these structures, although often extending more or less to adjoining parts.

53. V. Causes. — *A. Predisposing causes.* — The several forms of tetanus are more frequent and more fatal in the male, than in the female sex. This is partly owing to greater exposure of the former to the exciting causes, especially to injuries, accidents, and wounds. Of the influence of temperament in favouring the occurrence of the disease, we have no certain knowledge; but probably the nervous and irritable temperaments are most prone to it. There is no doubt of the much greater liability of the negro race to every form of tetanus or trismus, than of the white race. Climate and locality have a marked influence in predisposing the frame to a tetanic seizure. This is evinced by the much greater frequency of the malady in hot, than in temperate climates, and in humid and malarious localities, than in dry situations. Disorders of the digestive organs, especially the retention of morbid secretions and excretions in the digestive canal, the existence of intestinal worms, the failure or arrest of the depurating functions, and the consequent contamination of the circulating fluids, are amongst the most frequent causes of predisposition. Bodily fatigue, harassing duties and occupations, excessive muscular exertions, and irregularities of diet or unwholesome food, are also causes of predisposition. The catamenial period, parturition, and abortions also favour the occurrence of the disease in females.

54. *B. The exciting causes*, in temperate climates, are chiefly injuries and surgical operations. Punctures and lacerations of fascia, tendons, and nerves; lacerations and ligatures of nerves; and injuries of the extremities, especially of the hands and feet, are the most frequent causes; but wounds in any situation or part of the body, and of every kind and grade, from the sting of a bee or wasp, or the abrasion of the cuticle, to the amputation of a limb, may produce tetanus. A cleanly incised wound is much less likely to occasion this disease than a puncture or laceration. But, although these injuries are chief causes of the attack, the influences of the predisposing causes, and of those which are mainly concerned in producing the idiopathic form of the disease, in concurring to develope the malady, should not be overlooked. The causes which thus give rise to the idiopathic state of the malady, and which so often concur with injuries in developing the symptomatic form are, vicissitudes of temperature, exposure to the heat of the sun, more particularly to the sun's rays, and soon afterwards to the chills, dews, and cold of night; sleeping on the ground, especially when exposed to the night dews or moon's rays; exposure to currents of air, or to cold and wet in any way; drinking cold water, or other cold beverages, when the body is perspiring; imprudent cold bathing; sleeping in confined and ill-ventilated apartments; breathing a contaminated or a miasmatous atmosphere; and such laborious occupations as making trenches, digging clayey soils, &c. Whilst these concur with, or aid injuries or wounds, in giving rise to tetanus, they frequently of themselves occasion the disease, especially in hot climates, and in the dark races, more particularly the negro race, by arresting the eliminating processes, and by favouring the accumulation of morbid materials in the blood, which enter into new combinations, and irritate the nervous centres and membranes, and the muscular structures themselves, both directly and indirectly, by means of the nerves. Owing to a stricter attention in preventing these predisposing and concurring causes, and to the adoption of a more wholesome diet and regimen, the several forms of tetanus are now much less frequent than they were many years ago, more especially the traumatic or symptomatic form. Tetanus may be produced by some poisons, particularly by nux vomica, and its preparations (See Art. Poisons §§ 364—381, *et pluries*).

55. As I shall have to show hereafter, certain of the exciting causes seem to act more directly on the spinal medulla than others, whilst many of these causes occasion a state of the most distressing irritation, transmitted through the medium of the ganglial system, or of the sentient nerves, or even through the media of both, to the cerebro-spinal centres, and thence reflected on the muscles of voluntary motion. Thus worms in the digestive canal, not only predispose to attacks of traumatic tetanus, but also directly occasion the idiopathic form of the malady. That these parasites are no infrequent cause of tetanus has been insisted upon by Avicenna, Schenck, Hillary, Bisset, Rush, Chalmers, Michaëlis, Rahn, Zulatti, and De Haen; and not by worms only may the disease be thus occasioned, but also by whatever inordinately irritates the intestinal canal, as the retention of the meconium, or the use of drastic purgatives, in infants. I have seen it caused by internal strangulation of the bowels, the primary lesion being accurately ascertained only after death. A temporary state of tetanus has even been produced by the passage of gall-stones, as was shown by a case which lately came under my care, emprosthotonos, of many hours' duration, having been thereby occasioned, with the slowness of the pulse which usually attends this form of biliary obstruction, the attack having been not only severe, but also protracted. Tulpius has recorded an instance of the disease having bee-

occasioned by calculi in the kidneys; and I have observed the sufferings produced by the passage of calculi along the ureters, accompanied by spasms so general, so continued, and so severe, as closely to approach the tetanic state.

56. Several of the causes are very rarely productive of the malady, as caries of the vertebræ; whilst others which had more frequently occasioned it, are fortunately not so often observed now as in former days. Tetanus not seldom followed a recourse to torture, as torture was practiced either by civil authorities or by pseudo-religious inquisitions, or by military and naval commanders; but whether the wretched result proceeded from the excessive pain thereby produced, or by the irritation excited in the tissues — the integuments, the nerves, the muscular or the tendinous fibres — of the parts which sustained the injury, cannot be readily determined. Harder says, that he has seen it follow pain only; but it may justly be admitted, that excessive pain may have predisposed the system to be affected by the irritation more permanently developed in the seat of torture. That the disease may follow either burns or scalds has been admitted by many writers, and has been shown by Smith, Fizeau and others; and that it may be caused by fright or terror has been proved by Riedlin, Piderret, Hansa, Bierling and Latour. De Haen says that he has seen it produced by retrocedent gout; and probably the *materies morbi* of gout in the blood had so excited the spinal medulla and membranes as to develope a state of morbid or continued contraction of the muscles, amounting to idiopathic tetanus. Wright and other writers have insisted much upon the influence of insolation in warm climates, or in warm seasons in temperate climates, in occasioning tetanus, and with much justice, as inter-tropical physicians will admit; and no less just and important is the fact shown by Avicenna, and adverted to by many since the days of the celebrated Arab, that sleeping on the ground, especially after exposure to the sun's says, or whilst exposed to the night dews, or to the moon's beams, is a most influential cause of idiopathic tetanus, and of the development of the malady after injuries, wounds, &c.

57. C. The *Formative period* of tetanus, or the time which elapses from exposure to the causes until the commencement of the attack, is a matter of some importance, as respects the elucidation of the manner in which the causes act, and the employment of measures calculated to prevent the development of their effects. The duration of this interval is most various — from an hour or two to fourteen days, — most frequently, in cases of injury, from the fourth to the fourteenth day. In the returns furnished by Sir J. Macgrigor, the interval never exceeded three weeks. Sir G. Blane mentions four weeks as the longest period. Sir B. Brodie observed the disease to commence generally in the second week. Mr. Curling refers to an instance recorded by Mr. Ward, of the occurrence of the malady ten weeks after a burn in the axilla. May not some other cause or causes have occurred in this interval?

58. It has been noticed by Mr. Curling and others, that the longer the interval between the receipt of the injury and the appearance of the symptoms, the less acute and dangerous is the disease. In thirteen cases the symytoms did not commence until three weeks after the wounds, and only four of these were fatal; and of seven cases in which the symptoms did not appear until a later period, or about four weeks, only two terminated fatally. The more rapidly the disease follows its exciting cause, the more acute and fatal does it prove, in both the idiopathic and the symptomatic form.

59. D. *The state of the injury* or wound at the commencement of the disease, is a subject of interest. Dr. Rush remarked, that there is an absence of inflammation or free suppuration from the wounds causing tetanus. This generally appears to be the case. The injury either seems to be healing, or is quite healed, and even forgotten, when the disease commences. In some instances a feeling of irritation is referred to the injury or cicatrix; and in others a cause of irritation, of a material or palpable nature, is detected in one or the other, or is found to affect a branch or filament of nerve. In others no such feeling or cause apparently exists. If a healthy suppuration have existed in the wound, it is usually suspended, and is followed by an ichorous, or scanty sanious discharge, just before the accession of the spasms of the muscles of the jaws and neck and the difficulty of deglutition, or contemporaneously with the accession of the premonitory symptoms mentioned above (§ 4.).

60. VI. The Prognosis.—The *issue* of tetanus varies with the causes, and with the form which the disease assumes. A fatal result is most frequent in the traumatic form. It is less frequent in the idiopathic form, and much less frequent in the sub-acute, whether idiopathic or symptomatic, or when the malady is prolonged beyond the ninth or tenth day. Much, however, depends not only upon the exciting or efficient cause, but also upon the influence of concurring causes, as exposure to cold and wet, to malaria, or to an impure or often respired air, and the presence of intestinal worms, either, or all, of these tending remarkably to increase the mortality of the traumatic form. The concurrence of malaria or other impurities of the air, with exposure to cold, also greatly increases the fatality of the idiopathic states of the malady. Recovery very rarely takes place if the pulse rise above 110, in the intervals between the exacerbations on the third day, especially in the traumatic form; still more rarely, if it reach 120 on that day; and no hopes may be entertained, if the pulse in that form reaches this latter frequency on the second day, or at an earlier period. Dr. Parry thought that, if the pulse of an adult be under 110 on the fourth day, the prognosis is favourable; and if 120 or upwards, unfavourable; but cases frequently terminate fatally on the third, fourth, or fifth day, and yet the pulse, in the intervals between the paroxysms, has not risen above 100, or 110, or even, according to some writers, above 80 or 90, although this latter state of the pulse, in acutely fatal cases, does not quite agree with my observation. Dr. Druitt has very truly and ably stated that, "as a general rule, the prognosis is *favourable*, if the complaint is partial, — if it does not affect the muscles of the glottis, — if it has lasted some days, without materially increasing in severity, — if it is sensibly mitigated by the remedies employed, — if the pulse is not much accelerated, — if the patient sleeps, — and if he has been subject to it before, in an intermittent

form. On the other hand, the prospect will be *unfavourable*, if the spasms continue to increase in severity, and especially if they affect the muscles of the glottis;" and I would add, or if they extend to the diaphragm and other muscles of respiration; and if the disease be very acute and the pulse very frequent on the second day.

61. VII. PATHOLOGICAL INFERENCES and REMARKS.—*a*. That a predisposition, original or acquired, exists in some constitutions to be affected by tetanus, when the exciting causes, by their nature or their concurrence, are brought into operation; that this predisposition is most evident in its original state, in the negro race, and in the darker races; and that males appear to be more susceptible of this malady than females.

62. *b*. That depressed states of organic nervous power, connected with nervous susceptibility and with increased irritability, seem to favour the occurrence of an attack of tetanus; and that, still more especially, the presence of worms in the digestive canal, disorders of the digestive and intestinal functions, intertropical or warm and miasmatous localities, or otherwise contaminated states of air, and the arrest of the excreting processes, further tend to favour the appearance of the malady, by accumulating excrementitious materials in the blood, and aid the operation of the exciting causes enumerated above (§§ 54, *et seq.*).

63. *c*. That the lesions of the nervous centres of animal life, on which tetanus has generally been supposed to depend may be: — 1st, that of erythism, or of irritation, in which vascular injection and organic lesion are either not seen, or not manifested to any considerable amount, or so as to be admitted as inflammatory;—2dly. Or, that of increased vascularity and the changes generally viewed as constituting inflammation, or consequent upon it; — 3dly. Or, any change intermediate between the extremes of these states — the minima of the former, and the maxima of the latter — may be inferred to exist in cases of the several forms of this disease.

64. *d*. That similar lesions, in their nature and amount, to those just stated may exist in the sentient or centripetal nerves, or in the ganglial nerves, which are the media by which the irritation is transmitted from its primary seat to the spinal medulla and central parts of the base of the brain, although lesions in these communicating nerves are not easily ascertained, traced or rendered apparent after death; or they may be such as are compatible only with the living state, and disappear soon after dissolution.

65. *e*. That any irritation at the periphery of the nervous sphere may be propagated by sentient nerves to that part of the nervous centres with which the part irritated is most intimately connected or related, and be reflected thence upon muscular parts, through the motor nerves which are most intimately connected with those portions of the nervous centres to which the irritation is transmitted.*

66. *f*. That the irritation of the muscular structures themselves, directly produced by the accumulation of morbid and irritating materials — acid or saline — in the blood, may induce a more or less continued state of spasm of the muscles, and the existence of these materials in the blood, may perpetuate this state and superinduce further changes in the nervous centres and in their membranes, this state of the blood being produced as above noticed (§ 52.).

67. *g*. That the irritation thus excited may be perpetuated or continued to the extinction of life by asphyxia or by vital exhaustion, without the changes actually constituting inflammation having been developed — at least to an amount admitting of their permanent manifestation or undoubted existence after death.

68. *h*. That, although this (§ 67.) may be the case, especially in the traumatic form of tetanus, and more especially when the ganglial system, which is so intimately connected with the existence of irritability in all animals, is brought within the sphere of morbid action, yet inflammation and its usual consequences actually does sometimes take place, but not so frequently and evidently in the traumatic, as in the idiopathic malady.

69. *i*. That the inflammatory changes observed particularly in the idiopathic form, as when occasioned by insolation and by subsequent exposure to cold or the night dews, or by sleeping on the ground, &c., may be early produced, the tetanic phenomena being merely the manifestation of the early inflammatory state and changes in the membranes or substance, or in both, of the spinal medulla, extending often to, if not originating in, the medulla oblongata and the central parts of the base of the brain; and that the changes, whether inflammatory or merely irritative and incapable of demonstration, which first take place in the nervous centres of animal life, should be looked for in the parts most intimately connected with the origins of the nerves supplying the muscles of the pharynx, lower jaw, throat, and neck; these changes, as they extend along the membranes of the medulla oblongata and chord, extending the sphere and the severity of the malady.

70. *k*. That, in these cases (§ 69.), according to my observation, the pain which is commonly felt in the occiput, and in the cervical and dorsal regions of the spine, with the throwing backwards of the head, &c., in addition to the symptoms pathognomonic of tetanus, early declare the seat and nature of the disease — irritation or inflammation of the parts now mentioned (§ 69.).

71. *l*. That, in cases which arise from irritation in some distant part, transmitted to nervous centres and reflected thence upon contractile structures, and in which inflammatory action is either absent, or its existence is problematical at an early period of the malady at least, we canno infer, agreeably with what we know to take place in the animal œconomy, that inordinate or continued contraction of muscles can exist, without an increased demand being made upon the circulation supplying the nervous centres which actuate these muscles; and hence we may conclude that increased vascularity, or even the earlier states of inflammation, of these centres and of these membranes may be the necessary consequences of the continued and inordinate muscular action constituting the disease; the augmented determination of blood thus directed to these nervous centres

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* This view is identical with that stated with reference to the pathology of CHOLERA, CHOREA, and CONVULSIONS, articles which were written more than three years, and published in 1832, or about two years, before Dr. M. HALL's earliest writings on the reflex *function*.

tending to the perpetuation and the extension of hte muscular contractions, and thereby to the more or less rapid extinction of life.

72. *m*. That, notwithstanding this condition of the nervous centres of animal life, whether primary or superinduced, it is most probable, that the contractions would not become so persistent, or the spasms so severe and frequent, if the ganglial system preserved a normal state of function, or was free from irritation or vascular excitement.

73. *n*. Inferring, as stated above (§§ 63, *et seq.*). that tetanus may depend upon, or be connected with, one or other of three pathological states of the nervous centres of animal life, namely, — 1st. Upon inflammatory action of these centres or of their membranes, especially in the idiopathic form of tetanus,—2nd. Upon inflammatory action superinduced upon irritation transmitted from the periphery of the sentient nerves to these centres, or from ganglial nerves to these centres, and thence reflected on contractile structures, — and, 3rd. Upon irritation thus transmitted and thus reflected, without sufficient proof of inflammation, — it should become an object to ascertain with all possible accuracy, to which of these pathological states the case belongs to which we are called to administer relief; for, upon the inferred pathological condition, the indications and the plans of cure should be based.

74. *o*. Many of the changes which are presented by the lungs, the heart, the blood, and even by the liver and digestive mucous surface, are manifestly results of the mode of death. Those seen in the pharynx and glottis are evidently caused by spasms of those parts, consequent on the irritation or inflammation, or both, existing in the medulla oblongata and its vicinity, and upper portions of the spinal medulla, or their membranes. Yet other morbid appearances may exist in different portions of the digestive canal, or in one or other of the urinary or genital organs, which cannot be viewed as the results either of the malady or of the mode of death; but which may be considered as being either sources of irritation, or as concurring aids to irritation, or merely as accidental and unimportant changes: if they be viewed in the former light, it becomes important to ascertain how far they can be connected with the early or premonitory symptoms, and to determine the manner in which the functions of the organs in which they were seated, had been discharged.

75. *p*. That, when tetanus follows irritation or injury in some peripheral part of the nervous system, the division of nerves or parts between the seat or cause of irritation and the nervous centres most frequently fails of arresting the disease; such failures evincing the superinduction and extension of the irritation, or other morbid condition constituting the malady, to the nervous centres of animal life, and probably also to the organic or ganglial system, to which I imputed irritability in its normal manifestations very many years ago, and more recently in this work. (See Arts. IRRITABILITY and IRRITATION).

76. VIII. TREATMENT.—A slight experience of the different modifications of tetanus, more especially of the idiopathic, symptomatic, and infantile forms, is sufficient to show the justice of the distinctions which I have endeavoured to establish, between what may be considered as the inflammatory and the irritative states of the malady. But as either state does not exist simply or unassociated — as one condition is accompanied with more or less of the other — as the irritative often sooner or later becomes inflammatory, or the former state frequently induces the latter, the difficulty of determining in practice how far the one state may exist independently of the other is remarkably great. Unfortunately a simply inflammatory state of either the membranes, or the substance of the central parts of the base of the brain and medulla, or of both the membranes and substance of these parts, is seldom so manifested as to admit of a distinct recognition, the very phenomena which it sympathetically produces either masking its presence, or throwing doubts on its existence. Besides, irritation is so nearly allied to inflammation, even when it exists simply, and so often excites the inflammatory state, by eliciting vascular determination and injection — "ubi irritatio, ibi fluxus" — that we can hope only to reach an amount of accuracy which may not altogether be deserving of being considered erroneous. If the difficulty of ascertaining pathological conditions, upon which all rational indications of cure should be based, be so great in this malady as not to have hitherto been overcome, can it be a matter of surprise that the means which have been resorted to, both by physicians and by surgeons, in its treatment, have been most opposite in their effects, the most different in their natures, and in every respect most empirical and uncertain? In this state of our knowledge it would be better to leave Nature to her unaided efforts, to observe closely and accurately what is the true procession of changes and of their manifestations, and to ascertain the seats and the extent of lesion as soon after death as may be attempted with propriety.

77. I have contended above, more strenuously perhaps than any previous writer, for the inflammatory character of this malady, especially in the idiopathic form. But admitting the existence of this character, as manifested by the changes observed after death, the following questions remain to be determined, namely, Is the inflammatory state necessarily or always evident to the close observer during the life of the patient when it actually exists? and, if it be evident, Is it most successfully treated by the usual means resorted to, when combating the sthenic form of inflammatory action? — 1st. As respects the former question, it may be said, that inflammation of either the substance or the membranes of the spinal medulla, or of the medulla oblongata, or parts in the vicinity, is often ascertained with great difficulty. This is apparent from what I have said when treating of spinal inflammations (see art. SPINAL CHORD, &c., §§ 137, *et pluries*); and there I have viewed them as they are usually presented to both physicians and surgeons in the course of practice — as commonly limited to a portion only of either the membranes or substance of the chord, or as advancing along them gradually, and attacking successively adjoining portions. But, when the inflammatory action of these parts extends rapidly, or takes place almost co-ëtaneously, the effects upon contractile structures are quickly and extensively manifested. Whether, therefore, it be irritation or inflammation which

is produced in the spinal medulla and its membranes, or irritation quickly inducing a certain amount of vascular injection or inflammation, or merely an exalted polarity of the spinal chord, as contended for by K. Sprengel, there is reason to infer, that the morbid condition is at first limited in extent, although advancing rapidly, and that it commences in the more immediate vicinity of the origins of the nerves supplying the muscles of the pharynx, lower jaw, and neck. When pain is felt in the cervical region of the chord, extending either upwards to the occiput or downwards to the dorsal and lumbar regions, when the sensibility of the surfaces, whose nerves are connected with those parts of the nervous centres, is unusually increased, or when any stimulus acts upon the muscles connected with these parts, so as to occasion spasm or distress, as when attempting to swallow, it may then be inferred, that a morbid action, usually termed inflammatory, is really present in the membranes or structure of these parts, although pain and other symptoms may not be exasperated by pressure on that portion of the spine where inflammation of the chord or its membranes is indicated; pressure no further influencing the pain than it would if it were made upon some part of the cranium when the brain is similarly affected.

78. 2nd. Admitting the presence of inflammation in the spinal medulla, or central parts of the base of the brain, or their membranes, in many, if not in the great majority of, cases of tetanus, either at an early or in an advanced stage, or consecutively upon transmitted irritation, the success of such means as are usually employed against inflammation still remains questionable. We know that the term inflammation has been applied to very different states of vascular injection, as I have shown when treating of inflammation, and that these states differ as to the current through the capillaries, as to the power or tone which these vessels manifest, as to the products or fluids which are exuded from them during these states, and as to the extension of the morbid action or condition to continuous or contiguous tissues. Hence, even when the first question is admitted in the affirmative, we must have recourse to the results of an enlightened experience for our answers to the second: and these answers only can be given, so as to be satisfactory, by referring to the effects of such means as are most successful in removing changes commonly considered as, and denominated inflammatory. But it should not be overlooked, that it has been most satisfactorily shown, that these changes are so different in their local characters, in their constitutional relations, and in their tendencies and results, as to require for their successful issues very different and often opposite means of cure; the differences being occasioned chiefly by the varying grades of organic nervous power, and by the presence of irritating or injurious excrementitious materials in the blood (§ 52.). These facts have been fully illustrated when treating of the several forms, varieties, and modifications of *Inflammation* in the different organs and tissues; and what has been proved and admitted of inflammation generically, and of the special manifestations of it in these organs and tissues, may be extended to inflammation in those parts of the substance and membranes of the nervous centres to which the disease has been now chiefly referred.

79. But, it should not be overlooked, that whilst the fully developed malady may be attributed to an inflammatory state of these parts, induced by transmitted irritation, the primary morbid condition, especially in the traumatic or symptomatic form of the malady, — the irritation existing, whether manifested or not, in the seat of injury, propagating itself to the nervous centres, there developing morbid action, and perpetuating reflex muscular contraction,— should be attempted to be removed or counteracted by the most efficient and appropriate means. Whilst the local or primary irritation exists, or its transmission along centripetal nerves is not interrupted or prevented, the procession of irritation to inflammatory action, and the extension of this action along the membranes, with the reflected muscular contractions, are thereby promoted, and the morbid consequences — the tetanic contractions and spasms — necessarily aggravated. Therefore, at all periods of the malady, but as early in the treatment as possible, means should be employed, in *the traumatic form* of the malady, *to arrest the transmission of irritation from the seat of injury to the nervous centres, or to allay irritation in this seat.*

80. *A.* The local Treatment of traumatic tetanus should therefore be as early as possible determined upon; the means being such as are most suitable to the nature of the injury. To obtain the end now stated — 1st. Amputation or excision of the wounded part;—2nd. Division of the nerves proceeding from the seat of injury;—3rd. The application of agents calculated to procure a healthy action or a free suppuration in the injured parts, — and 4th. A recourse to soothing or anodyne applications to these parts, and in the course of the nerves proceeding from them, have been severally recommended, and have been found of service in some cases, and inefficacious in others. It is obvious that, when the symptoms of tetanus, and even when those of its first stage, trismus, have appeared, the pathological changes in the nervous centres and their membranes have already commenced, although they may not be fully developed; and that the removal of the remote irritation which produced these changes may not then be influential in subduing them. Nevertheless, the removal of the cause may render the effects either more mild or more controllable by treatment, — may prevent the effects from reaching that amount which the continuance of the cause might develope.

81. *a.* Instances of recovery from acute traumatic tetanus, after *amputation* had been employed in order to arrest the attack, have been recorded by Larrey, Valentin, White, Howship, and others; but recourse to it has also failed with many. Mr. Curling states, that it was performed in eleven of the cases in the table which he has given, and of these seven were cured. In most of these, however, the operation was resorted to before the symptoms were fully developed, at which time only should hopes of success from it be entertained. It is inadmissible in sub-acute tetanus, unless the condition of the injury be such as demands the operation independently of the spasms; for most of the cases of this form recover, often notwithstanding the treatment which has been

adopted. Mr. Curling very justly remarks that amputation is justifiable only after a severe injury of the extremities, immediately that there is the slightest indication of spasm; for, if delayed until the disease is more advanced, instead of proving beneficial, it will rather aggravate the symptoms and render the constitution less able to sustain the exhausting effects of the spasms.

82. *b. Division of the nerves*, in order to arrest the transmission of the irritation from the injured part, and even of the *tendons* and *aponeuroses*, when these are lacerated or injured, has been advised and practised in some cases with marked success by Schmucker, Hicks, Delaroche, Murray, Fournier, Stütz, Larrey, and some others. When this operation can be performed so completely as to comprise all or the chief nerves proceeding from an injured part, it should not be neglected, nor delayed until the disease is fully evolved. It is in every respect to be preferred to amputation. Dr. Pennock has advised the application of ligatures or cupping-glasses, in order to paralyse the nerves, when a complete division of them cannot be effected, as previously recommended for poisoned wounds. In cases of cutaneous or superficial injuries, &c., these means may be resorted to.

83. *c. Incisions* made into the seat of injury, and *applications* which may excite a free suppuration in it, have been recommended by Rush, Valentin, Mercier, Campet, Larrey, Parant, and many others. The actual or the potential *cautery* has been advised by some, with this intention; and a free opening into the seat of injury, or re-opening of the cicatrix, or incisions into it, and the application of various substances, with the view of exciting healthy action, have been recommended by others. In one case, I directed the injured part to be freely incised, soon after the occurrence of spasms of the muscles of the wounded limb, and the incision to be filled with lint soaked in equal parts of tincture of opium and spirits of turpentine, the same substances being also applied as an embrocation, on flannel, in the course of the nerves proceeding from the part; but, as the treatment about to be noticed was employed at the same time, the share which these means had in the recovery of the patient is not very manifest; the local symptoms, however, appeared to be much alleviated by them.

84. *d. Soothing, emollient*, and *anodyne* applications were advised by Hippocrates, Celsus, Cælius Aurelianus, and by many of the moderns, to the injured part; they may be employed either immediately or after the division of nerves or the incisions already noticed. These means have not been restricted to the part, but have likewise been applied in the course of the nerves proceeding from it. The agents which have been thus employed by the more recent writers consist chiefly of moist heat, anodyne poultices, fomentations, or embrocations; applications containing either opiates, or conium, or belladonna, &c. It has also been recommended by Cerioli, Lembert, and others, to remove the cuticle from the parts in the vicinity of, or above the seat of injury, and to apply either of the preparations of *morphia* to the denuded surface. It is obvious that these, or similar means, can be of use only early in the disease, and as aids to other rational measures.

85. *e.* Whilst *these local means* are more or less appropriate to traumatic or symptomatic tetanus, and chiefly to the acute form at a very early stage of the attack, and are useful aids to the treatment which the pathology of the disease will suggest, the measures about to be passed under review *are equally suitable to all the forms of the malady*, duly adapting them, however, in respect of amount, combination, and succession, to the severity and peculiar features of individual cases. It should not be supposed that all cases which recover, especially those which I have denominated as sub-acute, and more particularly such as are symptomatic of, or associated with, other diseases, as with hysteria, or with epilepsy, or even with the effects of malaria, as insisted upon above (§ 22.), are really cured by the means which have been employed. Nature in many of these cases asserts her own prerogative, and carries it above the many and incongruous agents too often irrationally, empirically, and injuriously resorted to. If we consider the diverse and even opposite nature of the measures which have been prescribed for this malady, their apparent success in some instances and their failure in others, and their employment in different states of the disease, with little regard to the modes of their operation in relation to pathological conditions, we necessarily must infer that recovery has sometimes taken place, notwithstanding their use, and not by their aid.

86. *B.* The external means recommended by writers are almost as numerous as those prescribed internally, and whilst they have been used as adjuvants by some, they have been more entirely confided in by others. — *a.* Not the least important of these are the *affusion of cold water* and the *cold bath*. The former was prescribed by Hippocrates, but he directed the patient to be afterwards wrapped in warm coverings. The cold affusion was also adopted by Avicenna, Schenck, Kite, Rush, Wright, Tallmann, and Currie, for this disease; and the cold bath by Cochrane, Harris, Moseley, and the writers now mentioned. Celsus considered the cold bath to be injurious. Fischer advised it, opium having been given internally. In the cases in which opium has been taken in large or frequent doses, the cold bath, and more especially the cold affusion on the head and cervical spine, are much less hazardous, if not beneficial, in this disease than when they are resorted to under other circumstances. Both the cold affusion and the cold bath are not without some degree of risk, if the shock produced by either be too sudden or too severe for the amount of vital power. But when judiciously employed, and the effects carefully watched, and aided by appropriate internal remedies, they may, especially the cold affusions, prove most influential means of cure, more particularly in the idiopathic form of the malady. Many instances have been recorded of recovery from acute tetanus, by means of cold applied in either of these modes, or in some other way. The changes found on dissection after fatal poisoning by *nux vomica* and *strychnine* are the same, as respects the spinal medulla, the central parts of the base of the brain, the cerebellum, and their membranes, as those observed in fatal cases of tetanus; and the treatment found most successful in poisoning by these substances is generally appropriate in acute tetanus. (See *art.* Poisons, §§ 364 —

381.) M. Guérin de Mamers states, that the cold affusion arrests the tetanic paroxysms produced in animals by nux vomica. The application of cold lotions, or of pounded ice, to the occiput and nape of the neck, whenever or as long as the temperature of these parts is above the natural standard, has not hitherto received the attention it deserves as appropriate means in this disease.

87. *b. Warm baths* and *Vapour baths*. The former were recommended by Marcard and Behn. Sir J. Macgrigor found them to produce momentary relief only. Hillary and De Haen have stated that instantaneous death has sometimes followed their use. This result may have arisen from their temperature having been too high, especially when the patient was first immersed. Warm baths are the safest, if not the most beneficial, when their temperature is at first from 85° to 90°, and gradually raised to 96° or 98°. They have little influence on the acute form of the malady; but they are often of service in the sub-acute, and during convalescence. Behrends, Mursinna, Stütz, and Marcus prescribed warm baths, containing alkalies and aromatics; and Anderson recommended tobacco to be infused in the bath, and after the operation of purgatives, wine to be freely exhibited. Warm baths have been employed chiefly in connection with the internal use of stimulants, tonics, and antispasmodics. Dr. Marsh has recorded three cases, in which *vapour baths*, at a low temperature, were employed for many hours in succession. Two of the three cases recovered; but they were of the sub-acute form. These baths have been also prescribed by several Continental physicians; but with no advantage in the acute form of tetanus.

88. *c. Emollient applications* over the spine in this disease were noticed by Hippocrates, Celsus, Cælius Aurelianus, and others; and these applications either consisted of vegetable oils, or were aided by *oleaginous frictions* over the general surface of the body. That they may have appeared of some service in sub-acute cases may be admitted; but that they were in any way of service in the acute admits of doubt. *Frictions* along the spine were advised by Celsus and many others.

89. *d. Rubefacient and oleaginous Liniments and Embrocations*, applied over the spine, were employed in tetanus by Aretæus, Avicenna, Ruland, De Haen, and Stütz; but the benefit to be derived from them in the acute form was doubtful, although they may have proved of service in the sub-acute. I have prescribed certain of the *Liniments* contained in the Appendix (*See Form.* 295—297. 307. 311.) with apparent advantage, or equal parts of the turpentine and of the compound camphor liniments of the London Pharmacopœia, with a little Cajuput oil, when applied constantly along the spine, in the form of an embrocation, by means of flannel or spongio-piline. — *Sinapisms* and *Blisters* over the spine were recommended by Rush, Hunter, and Latour; but Chalmers contends that they produce an injurious effect. The application of the *actual cautery* to the neck is mentioned by Celsus; but it has not received the sanction of modern writers.

90. C. Constitutional and Internal Means. — *a. Antiphlogistic measures* have been advised by many writers, and more or less censured by others, in this disease. But the selection of these measures, the extent to which they may be carried, and their adaptation to the peculiarities of individual cases, are of the utmost importance, rendering them either beneficial or the reverse. — (*a.*) Of these means the most dangerous, and yet often the most beneficial, is *bloodletting*. For, if prescribed in cases where debility and irritability are very manifest, where the disease is far advanced, where the pulse is very rapid between the paroxysms, and where the disease follows an injury, bleeding, especially from a vein or to any considerable amount, is more frequently injurious than beneficial. The evidence in its favour is extremely contradictory. It has been recommended by Aretæus, Celsus, Paulus Æginеta, Forestus, Hillary, Pujol, Bisset, and many others; and its repetition, even oftener than once, has been resorted to by Coxe, Gardane, Guthrie, Earle, &c.; but the results have not always been satisfactory. Flajanini states that he has seen death immediately follow bloodletting; whilst Lisfranc says, that it has been carried to an enormous extent and been followed by recovery. Mr. Curling is not in favour of its adoption, unless early in the disease, and when the attack is decidedly inflammatory. In this, as well as in other maladies, the physician will be guided by a variety of circumstances. The appearances on dissection seem to favour the adoption of bloodletting, yet these appearances, if not produced, may be heightened, by the disease; and, even admitting them to have existed from the commencement, experience has shown, that inflammations of the spinal medulla, or of its membranes, are not so successfully attacked by bloodletting, as many other inflammations. When the disease is idiopathic; the patient young, robust, and plethoric; the pulse full, strong, and not very frequent or much above 100 between the paroxysms; and the disease is not far advanced, and especially if pain is complained of in the occiput and cervical region; then bleeding by a number of *leeches* applied in these situations, or *cupping* as advised by Celsus and Paulus Æginеta, appears to be indicated. In the circumstances, also, just mentioned, not only leeches or cupping along the spine, but also venæsection, may be practised, and even repeated, according to the effects produced. In more doubtful states, *dry cupping* along the spine may be tried. *Arteriotomy* has been recommended by Vogel; and several writers have considered, with much justice, that, when bloodletting is indicated, it should be carried to a full extent at once, and not repeated to a small amount at intervals. There can be no doubt that, in all spasmodic and convulsive maladies, however inflammatory the appearances may appear after death, or however accelerated or excited the circulation may seem during life, bloodletting, especially venæsection, is a hazardous remedy; and, although sometimes required in a decided manner, particularly in the circumstances and in the way just stated, it requires the utmost caution and discrimination. When it is clearly indicated, the action of other suitable remedies is promoted by it.

91. (*b.*) *Purgatives* are essentially requisite in tetanus and trismus; but, in order to obtain

satisfactory results from them, they should be given early and decidedly, and selected judiciously. Calomel with the compound extract of colocynth, or with jalap, or scammony, or camboge, may be prescribed in such doses as will produce, as advised by Forestus and Hamilton, copious evacuations. Moseley directed the cathartics to be conjoined with cinchona or other tonics. These, especially the more bitter tonics, generally render the operation of purgatives more certain. In the few cases I have seen, I have prescribed, at first, full doses of calomel with camphor; and, some hours afterwards, the spirits of turpentine with castor oil, the action of these having been promoted by enemata containing these oils and some common salt. The frequency of worms in the digestive canal of patients attacked with either idiopathic or traumatic tetanus, has induced me to prefer these means, and to give them in large or repeated doses early and according to the circumstances of the case. The oil of turpentine, when judiciously prescribed in this disease, is not only an energetic anthelmintic and purgative, but also the most certain antiphlogistic and antispasmodic remedy we possess. After the bowels have been freely evacuated by its aid, or by a combination of it with other cathartics, it may be given internally at various intervals, either on the surface of an aromatic water, or in the form of an electuary made with honey and powdered liquorice-root; and may be administered in enemata, or applied along the spine in the form of embrocation (§ 89.).

92. Where there is reason to infer that the disease is favoured, or in any degree occasioned by the presence of uneliminated acid, acrid or excrementitious materials in the blood, the action of the excreting viscera should be excited by means of these and other purgatives, by diuretics conjoined with or alternated with these, or by combining cathartics and diuretics with large doses of the alkaline carbonates, or of the chlorate of potash, or with magnesia and sulphur in full and repeated doses, so as not only to excite the several emunctories, but to change the state of the blood, and to counteract the injurious action of the morbid materials by combining with them and neutralizing their influence and effects.

93 (c.) *Mercurials*, internally and externally, have been very frequently prescribed in all the forms of tetanus, as purgatives, as alteratives, and as antiphlogistics, and have received the sanction of Manget, Donald Monro, Mease, Kite, Clark, Ecker, and others; and calomel, the bichloride of mercury, and the oxides, have been severally employed, in order to produce these effects. Calomel, given in full doses, alone or with other medicines, early in the disease, and as a cologogue purgative, is generally of use. But no confidence can be placed in it, or in any other mercurial, as a remedy for tetanus, especially the traumatic form. Mercurials were formerly much employed in the West Indies as purgatives and alteratives for the cure of idiopathic tetanus, but even when ptyalism has been produced by them, no alleviation of the disease has resulted, as shown by MacGrigor, Wells, Thomson, Carlisle, and Curling, tetanus even having occurred in persons during mercureal salivation; and the malady appearing to have been aggravated in other cases by the production of this effect. Of twelve cases related by Mr. Howship, of tetanus consequent upon injuries, in which mercury was freely exhibited two only recovered, and in both it was conjoined with opium.

94. (d.) *Antimonials* are uncertain in their operation in trismus and tetanus, and are liable to the same objections as have been urged against bloodletting, but they also possess the advantages sometimes to be procured from the latter. The preparations which are most deserving a trial in this disease, are tartar emetic and James's powder. In a case of sub-acute tetanus treated by Mr. Liston, the former was given in doses of one grain every hour, and the patient was put into a warm bath thrice in the day, the bath containing in solution half an ounce of tartarised antimony (*Lancet*, 1834 and 1835, p. 581). The pulse after the baths was generally accelerated, but became much softer as soon as the copious sweating by which it was followed appeared. Mr. Woodward (*Dublin Journal of Med. Science*, July, 1835) exhibited tartarised antimony in a case of idiopathic tetanus, with the effect of depressing the pulse and diminishing the muscular rigidity. The patient was soon able to swallow, and, by persisting in this remedy, gradually recovered. Dr. Ellis administered this substance in enemata; but no sufficient experience of the results of this practice has hitherto been furnished.

95. *b. Sedatives* of various kinds have been often prescribed for all the forms of tetanus. Certain of the means already mentioned are more strictly sedative than antiplogistic, although generally prescribed with the latter intention, especially the cold affusion and antimonials.—(*a.*) *Colchicum* has been recommended for tetanus by M. Dufresnoy. Dr. W. G. Smith has employed it largely in the West Indies, and, in his opinion, with great benefit. But as he employed several other means at the same time, the amount of benefit which was really due to this powerful medicine remains doubtful (*see* § 114.).

96. (*b.*) *Tobacco* has been much employed in cases of tetanus. Mr. Curling remarks that "the earlier writers applied the *oleum tabacci* externally to the back and neck." In a work by Dr. Gardner, at the beginning of the 16th century, entitled the *Triall of Tobacco*, it is stated that "the suffumigation of tobacco, being taken, is a good remedy for the starkeness or stiffness of the neck called tetanus." Campet, who practised in the French West India Islands in the last century, prescribed tobacco injections and wine by the mouth, and detailed several cases proving the success of the practice. The use of tobacco injections in this disease has subsequently been recommended by O'Beirne, Anderson, Earle, Travers, and Curling. In most of the cases the infusion, or decoction, or smoke of tobacco was administered as enemata, twice or thrice daily; and wine or other stimuli were given by the mouth, to counteract the distressing poisonous action of the tobacco (*see art.* Poisons, §§ 523, *et seq.*). This substance is one of the most powerful agents which can be employed against tetanus. Its effects are, however, seldom lasting, and it tends very remarkably, when given late in the disease, or when the dose is strong, to depress the powers of life beyond the powers of reaction. I have perused most of

what has been written in its praise, and I can truly state, that it has often proved injurious, owing to its having been resorted to at a too advanced period of the malady, and in a too powerful form or dose; and, even in the cases where it has appeared to have been of service, its effects appeared very equivocal. In two acute cases which I attended many years ago, the infusion of tobacco was administered as an enema, contrary to my advice, by the other medical men who were also in attendance, and both cases terminated fatally, with all the symptoms of poisoning by tobacco, a few minutes after the administration of the second injection. The bodies were examined after death, and displayed the appearances described above (§§ 27, *et seq.*). The decoction or infusion has been also employed in impregnating a warm bath, into which the patients have been immersed twice or thrice in the day.

97. The use of *tobacco* in tetanus requires the utmost caution. The sensations produced by it, when the dose is too powerful, are most distressing, and, when prescribed late in the disease, are such as often fatally prostrate the powers of life. Even when less injurious, patients have expressed the sensations occasioned by it to have been so distressing, that they would rather have endured the convulsions, painful as they were; and that they would hardly be induced to submit to a repetition of the medicine. Mr. Curling, who is much more in favour of its use than I am, states that, of nineteen cases in the table, in which tobacco was employed, nine recovered. There can be no doubt that this medicine was injudiciously prescribed as to form, dose, and period of the disease, and as to other means resorted to, in some of the fatal cases; but there is as little doubt, that in some of the cases which recovered, the result was not due to this substance. When the use of it is determined upon, in an acute or traumatic case, a scruple of the leaf should be the largest quantity for an adult, infused in twelve ounces or a pint of water, and administered as an injection. The dose ought not to be larger at first, although it may afterwards be increased according to its effects. If employed at all, it should be early in the disease; and it may then be so conjoined with other agents as to promote the operation of purgatives given by the mouth. During a recourse to it, the powers of life should be supported by tonics, stimulants, and nutrients, especially by wine, ammonia, and other means about to be noticed.

98. (*c.*) *Hydrocyanic acid* was recommended by Mr. H. Ward, of Gloucester, and given in a case detailed by him, at first every half hour in cinnamon-water; and, after three hours, the spasms having then been considerably relieved, it was continued every four hours, and was taken in wine. The patient ultimately recovered. Mr. Curling states, that this medicine was employed, in small doses, in three cases, all of which were fatal. It is obvious that, in small doses, but little advantage can be expected from it, and, in large doses, it requires great caution and a close observation of its effects.

99. (*d.*) *Æthers* have been prescribed in various combinations, in the several forms of tetanus. The compound spirit of sulphuric æther, and the hydro-chloric æther, were recommended, in conjunction with other sedatives and antispasmodics; but little benefit appeared to have resulted from them in the acute cases, and in the sub-acute their effects were doubtful. Recently, frictions with the sulphuric or the hydrochloric æthers, or with chloroform, have been prescribed; and probably much of the benefit supposed to have been derived from this mode of using these substances, has been produced by the inhalation of a portion of the vapour diffused in the air, during the use of them in large quantities in this manner.[*] M. Morisseau, in a case of traumatic tetanus, ordered the surface of the body to be assiduously rubbed with chloroform three times in the day. This treatment was continued during five days, and was attended by a copious perspiration. On the sixth day the patient complained only of general languor and debility (*Union Médicale*, 21st June. Paris, 1851).

100. The æthers and chloroform have been employed, especially by inhalation, with apparent success, both in this country and abroad, in tetanus and trismus. Nevertheless, they severally require a much more extensive and satisfactory trial in this disease, than has as yet been given them; and this trial should be made with greater precision, and ought not to be limited to one or two modes of using them, but extended to the exhibition of them by the mouth, to the inhalation of them with the atmosphere, to frictions of the general surface with them, and to the administration of them in enemata. Even although they may not be the means which should be mainly confided in, they will generally prove excellent adjuvants, and will palliate the most urgent symptoms.

101. *c. Narcotics* have been very generally employed in the treatment of tetanus, especially of the traumatic form.—(*a.*) Of this class of medicines, the preparations of *opium* and of its ingredient *morphia*, have been most frequently prescribed. Opinions respecting the use of opium in this disease, are not only different, but even opposite. This drug is recommended in various forms of combination, by many writers: by Larrey, conjoined with camphor and nitre; by Stütz, with the fixed alkalies in large doses; by Latham, combined with ipecacuanha in the form of the pulvis ipecacuanhæ compositus; and by Marcus in frequent and increased doses. It has been prescribed by the mouth, in enemata, and in embrocations and liniments applied externally. It has also been used conjointed with other substances, as with alkalies in warm baths; and certain of its preparations, as the aqueous solution, have been injected into the veins of persons af-

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[*] The following case of inflammatory idiopathic tetanus, by Dr. Tibaldi, will show the treatment employed for this form of the disease in the north of Italy:—A labourer, aged 28 years, was attacked with tetanus two days after lying on the damp ground while in a state of perspiration. In pursuance of the plan generally adopted in that country for this disease, he was bled eight times during five days, sometimes to as much as twenty ounces; and above a hundred leeches were applied to the painful parts. On the sixth day, the state of the patient being still severe, Dr. Tibaldi had the loins rubbed twice with sulphuric æther; the patient was bled a ninth time, and took half a grain of acetate of morphia. The frictions with æther allayed the spasms. The next day (the seventh) he was again bled, and an ounce of æther was rubbed over the back and neck. On the following day the patient could sit up, and was soon afterwards convalescent.

flicted with this malady. *Morphia* and its salts have likewise been prescribed, both internally and externally, in the several forms of tetanus, and not infrequently to a blistered surface, after the removal of its cuticle.

102. It is difficult, if not impossible, to form a correct or a precise opinion as to the effects of these preparations, or of the best modes of combining and administering them in this malady. Whilst several authors are favourable to the use of them, others of great experience, as Sir J. Macgrigor and Mr. Travers, consider them, if not objectionable, at least inefficient; and some writers have given opium, either in solution or in a solid state, in so enormous doses in this disease, without any very marked effect, as to induce a belief, either that the drug has not been swallowed, or that the system is insusceptible of its action during the malady. The truth, however, is that the opium, by the excess of the dose, paralyses the vital actions of the stomach, and it is retained in this organ without change. Moreover, there is no doubt that it has often been given both improperly and injuriously, as respects the quantity, the modes of administration, and the previous treatment. None of its preparations should be prescribed until the secretions, excretions, or fæcal accumulations have been freely evacuated. Either of them which are most congruous with the other medicines prescribed may then be tried, in decided and frequent doses, by the mouth or in enemata, in conjunction with antispasmodics, aromatics, stimulants, or tonics, or with camphor or ammonia, or the fixed alkalies, oxide of zinc, oxide of bismuth, or with castor, musk, &c., or even with wine or brandy, according to circumstances, or when the evidence of morbid irritation predominates above that of inflammatory action in the nervous centres and their membranes. In this state or form of the malady, the endermic application of morphia may be prescribed, whilst other medicines, as stimulants, antispasmodics, or tonics, are liberally taken; or the fluid preparations of opium may be administered in enemata with camphor, assafœtida, spirits of turpentine, &c.

103. MM. Percy and Laurent (*Journ. des Progrès des Sc. Méd.*, tom. iii. p. 257., 2*d. sér.*) injected a watery solution of opium into the veins, in three successive cases of tetanus, with success. This practice was adopted in eight instances, and recovery took place in five. MM. Delpech and Dubreuil had recourse to the injection of a scruple of the watery extract of opium dissolved in two ounces of water into the veins of a lady, aged 50, attacked with tetanus consequent upon the application of a caustic to an ulcerated os uteri. This solution was injected after three intervals of about twenty minutes each. The patient fell asleep; the pulse became full, and 70 in a minute from being 120, and the muscles were relaxed. Upon wakening from her sleep, the tetanic contractions returned, about eight hours after the injection. The operation was repeated, and was followed by the same results. The patient, however, sunk on the third day. MM. Percy and Laurent further state, that they have injected twenty grains of the extract of stramonium, dissolved in half an ounce of water, into the veins of several persons attacked with tetanus, and with success. They have also injected a strong decoction of this plant with similar results; but the details of these cases are not furnished in the work in which this statement is made, nor is any notice taken of instances of failure. The injection of a solution of acetate of morphia into the veins of two horses affected with tetanus was tried at the Veterinary School at Alfort, but the result was unfavourable. Mr. Sewell, of the Veterinary College, also tried this practice in a horse and in an ass, affected with idiopathic tetanus. The tetanic symptoms were removed, but the animals subsequently died from other causes, but not from a return of tetanus. (Curling, *Opus cit.* p. 202.)

104. Other narcotics have received, comparatively, but slight attention in the treatment of tetanus. *Stramonium* was considered of service by Dr. Begbie (*Trans. of Med. and Chirurg. Soc. of Edin.*, v. i. p. 285.); and *Belladonna* was recommended chiefly as a prophylactic by M. Sauter. The *Canabis Indica* was suggested, but I am not acquainted with any instances in which recovery from tetanus has resulted from its use: at least further experience of its effects in this disease is required.

105. *d. Alteratives* of various kinds have been tried for this malady, and several medicines, already noticed, have been prescribed in alterative doses, especially the bichloride and other preparations of *mercury*. When the disease is attended by morbid states of the blood, more especially by acid and other excrementitious materials accumulated in the circulation (§ 52.), large doses of the *fixed alkalies*, as advised by Stütz, or of *magnesia*, or of *ammonia*, as recommended by Blankard, after the bowels have been freely evacuated, will prove of service: but these should not be trusted to alone; they should be employed as will hereafter be recommended (§ 112.). The preference in such cases is due to magnesia, inasmuch as it both corrects this state of the blood and opens the bowels. Fowler's solution of *arsenic* was prescribed by Hull, Jenkinson, Holcombe, Taylor, and Miller in large and frequently repeated doses, in conjunction with opium and stimulants. The last-named physician gave ten drops of this solution every hour with as much tincture of opium in a spoonful of brandy, in four cases of traumatic tetanus, which terminated favourably (*New Engl. Journ. of Med.*, &c., Boston, 1818.). The administration of alkalies internally in large doses with opium, and the employment, at the same time, of alkaline warm baths, although praised by Stütz, Behrends, Wild, Else, and others, were denounced as inefficacious by Marcus and Ficker.

106. *e. Antispasmodics* and *stimulants* have been very generally prescribed in the several forms of tetanus. Of these, the most frequently resorted to are *musk*, *camphor*, *assafœtida*, *amber*, *castor*, *spirits of turpentine*, *the æthers*, and *ammonia*, variously conjoined with each other, or with opium, alteratives, and other stimulants. Ainslie, Huck, Zanetti, and others were favourable to the use of musk. Cheselden gave it with the tincture of opium, in moderate doses, and at short intervals. Chapp and Vogt prescribed the same medicines, but in larger doses; and Fournier recommended the musk to be given with camphor. The following is nearly the same preparation as that prescribed by him: —

No. 347. ℞. Moschi, Camphoræ, sacchari albi, āā ʒj.; Tere cum Mucilag. Acaciæ ℥vj.; dein adde Spirit. Ammon. Arom. ʒij.; Infusi Arnicæ ℥v. Misce. Capiat Cochl. j. amplum singulis horis.

Assafœtida and *castor* were favourably noticed by Celsus, Aretæus, and Schultz, and many others; but, in modern times, they have been given in tetanus chiefly in conjunction with the other medicines just mentioned, or with opium, either by the mouth or in enemata. Fournier and Pescay consider *ammoniacum* one of the most certain remedies for tetanus, but that it should be given in frequent doses, carried as far as half an ounce in the twenty-four hours. A successful recourse to spirits of *turpentine* has been had by Phillips, Hutchinson, Peacock, and Gibbon, who prescribed this medicine by the mouth or in enemata. In either mode, as well as externally applied, it is generally of service (§§ 89, *et seq.*). The *balsam of Peru* has also been administered both internally and externally in tetanus. Dr. Kollock states, in Harless' Annals, that he gave as much as ʒij. of this balsam in the twenty-four hours, in a case which terminated favourably.

107. *f. Tonics* of various kinds, and conjoined with stimulants, or with alteratives, or with narcotics, have been frequently prescribed in tetanus, often, however, too indiscriminately, and without due reference to the form, state, or stage of the malady. Rush considered this disease as essentially one of debility, and therefore prescribed for it cinchona, ammonia, wine, brandy, cordials, &c.; but, in addition, he directed the wound to be early opened or enlarged, and to be filled with lint soaked in spirits of turpentine, in the traumatic form of the disease. *Tonics*, *stimulants*, and *aromatics* of various kinds, and in different combinations, had been recommended by Celsus, Aretæus, and others amongst the ancients; the most energetic in their operation was advised for tetanus by Harkness, Parkinson, and Bisset. Dr. Bright prescribed the sulphate of *Quina*, with other stimulants; Dr. Elliotson, the *carbonate of iron*, in large doses; Dr. Smith, the *sulphate of zinc*; Rush, Moseley, Plenk, and Fischer, the *cinchona* in powder, or in decoction. The free use of *wine* was advised by Hippocrates, Hillary, Rush, Currie, and Hosack. I can only add that these, as well as antispasmodics, or stimulants, or alteratives, or narcotics are beneficial chiefly when prescribed with strict reference to existing pathological conditions. If the morbid irritability be characterised by debility, or by morbid states of the blood; if these states predominate over inferred inflammatory action in the membranes or substance of the spinal chord; if this action be not clearly indicated, or if it have been actively attacked by antiphlogistic measures; if the disease be traumatic or symptomatic; and if the secretions and excretions have been freely promoted and evacuated, then either of these classes of medicines, or various combinations of certain individual substances belonging to two or more of these, will be more likely to be efficacious than when otherwise employed. In these circumstances of the disease, tonics may be conjoined with antispasmodics, with alteratives, and with narcotics or sedatives, and be given every hour, or every two or three hours, according to their doses or to their effects. The following may illustrate such combinations:—

No. 348. ℞. Potassæ Hydriodatis ℈j.; Potassæ Bicarbon. ℈iv.; Tinct. Camphoræ Comp. ʒj.; Tinct. Cinchonæ Comp. ℥ss.; Tinct. Capsici ʒss.; Decocti Cinchonæ ℥vjss. Misce. Capiat Cochl. ij. larga, 2dis. vel 3tiis. horis, cum aquæ pauxillo.

No. 349. ℞. Moschi et Camphoræ, āā, ʒj.; Extr. Belladonnæ gr. vj. (vel Extr. Canabis Indicæ purif. gr. xii., vel Extr. Conii gr. xviij.). Tere cum Mucilag. Acaciæ ʒjss., et adde Ammoniæ Hydrochloratis ℈ij.; Hydrarg. Bichloridi gr. j.; Tinct. Serpentariæ ℥ss.; Tinct. Cinchonæ Comp. ʒj.; Decocti Cinchonæ (vel Infusi Valerianæ) ℥v. Misce. Capiatur Cochleare unum largum omni horâ, vel omni bihorio, in aquæ destillatæ pauxillo.

108. *g. Diuretics*, especially the *tincture of cantharides*, the spirits of *turpentine*, the spirits or oil of *juniper*, are said to have proved successful in cases of this disease by Gardiner, Brown, and Mease. The good effects of these are, however, most manifest when they have been given in such frequent or large doses as to irritate the urinary passages, or to occasion bloody urine. It has been said that the South Sea islanders, amongst whom traumatic tetanus is a frequent disease, endeavour to cure it by producing mechanical irritation of the urethra.

109. *D.* Successive and Combined Measures. —The *Treatment* of tetanus should not consist of an empirical employment of one or more medicines, the efficacy of which has been vaunted by some writers, doubted by others, and altogether denied by not a few. It is chiefly by a *succession* and *combination of means*, carefully considered and selected, and appropriately applied to the pathological conditions of each case, as far as these may be rationally inferred from the antecedents, and from existing phenomena. Much will necessarily depend upon the stage at which the case comes under treatment, upon the cause or causes which have produced the attack, upon the circumstances connected with the patient, and the means which have been already employed. The success of treatment will mainly also depend upon a right interpretation of the state of the pulse, especially between the exacerbations— upon the existing vascular action generally, and locally, as far as this may be inferred, from a close investigation of symptoms, especially from the state of deglutition, from the seat and extent of the spasms, and from whatever appears to excite or to allay them.

110. In the treatment of tetanus and of several other diseases, certain misconceptions often mislead the inexperienced physician, not the least injurious of which are the following: — 1st, That bleeding will generally cure, and that it is necessary to the cure of inflammatory action:—2nd, That there are no other means than this, upon which any dependence can be placed capable of effecting this purpose:—3rd, That all tonics, antispasmodics, stimulants, narcotics, &c., are contra-indicated, or are necessarily injurious, or at least inefficacious, where inflammation is present or blood-letting is required. It should therefore be recollected that, even when inflammation most unequivocally exists, blood-letting, when alone confided in, may be carried so far as to endanger life, without removing this state, especially when, owing to its seat, it occasions spasms or convulsions, or when its seat is the centre, or intimately connected with the centre, to which all impressions are conveyed and rendered objects of conscious sensation or perception, as is the case with the seat of tetanus and trismus. We ac-

cordingly find that blood-letting, when confided in alone, may be carried to the utmost, by repetition or otherwise, in the treatment of this disease, whether idiopathic or traumatic, and yet the desired result is not attained. Nevertheless, blood-letting, largely or repeatedly, may be required and prove most beneficial, when judiciously timed and directed, especially in the idiopathic form. But it generally requires several aids to the development of its efficacy, and, in tetanus more particularly, it is serviceable chiefly by favouring the operation of other means, although these means may seem calculated to produce effects very different from, or even opposite to, those expected from blood-letting. None of these means is more beneficial in this malady than purgatives such as have been mentioned above, aided, as occasion will suggest, by croton oil or other active cathartics, and by such other of the remedies noticed above as the circumstances of the case may warrant or require, especially by terebinthinates, internally and externally, by mercurials and by antimonials.

111. *a.* The *Symptomatic* or traumatic form of tetanus is not so manifestly benefited by vascular depletions as the idiopathic, unless the patient be young, robust, or plethoric; and unless pain be experienced in the occiput, cervical or dorsal regions of the spine; or other signs of the supervention of inflammatory action, upon irritation propagated to these regions of the nervous centres, be present; and in these circumstances blood-letting, general or local, or both, should be prescribed, according to the peculiarities of individual cases, and to the effects produced. Brisk cathartics, more particularly those already recommended, followed by antispasmodics, conjoined with sedatives or narcotics; or by tonics and stimulants, selected with judgment and prescribed with decision, are generally requisite, the period of exhibiting them, and the mode of combining them depending upon the acumen and experience of the physician. In this form of the malady, the *local* and *external means* mentioned above (§§ 80—89.) ought to be resorted to without the least delay; and be followed by active cathartics, and the other means which the progress and state of the disease will suggest. In this, as well as in the idiopathic, form of tetanus, *worms* often are present in the digestive canal, and either predispose to, or aggravate, the disease, more especially in warm climates, and in certain localities. Therefore the purgatives should have an anthelmintic operation, or *anthelmintic* medicines should precede the exhibition of cathartics, those already noticed being preferred, and administered by the mouth and in enemata.

112. In the symptomatic form of tetanus, where the indications of inflammatory action in the nervous centres or their membranes are hardly manifest, or are equivocal,—where violent spasmodic action and continued contraction are the chief and dominant symptoms,—the free evacuation of the bowels by chologogue, anthelmintic, and drastic purgatives, as already advised, ought to be the first *intention*, in connection with the local and external measures directed above. The next should be to support vital power and resistance, and to correct morbid states of the circulation, by administering the more powerful tonics, antispasmodics, and stimulants, in such combinations with each other, or with sedatives or narcotics, or with alkalies, as the circumstances of each case may suggest. If it be inferred, that the irritation has been excited, extended, or perpetuated by morbid or excrementitious materials in the blood, the free action of the excreting organs—of the bowels, kidneys, skin, &c.—should be promoted by the exhibition, either alone, or with tonics, stimulants, or aromatics, of diuretics, diaphoretics, and alteratives,—of alkalies, the nitrate or chlorate of potash, the citrate of magnesia, or precipitated sulphur with magnesia, camphor, turpentine, the balsams, &c.

113. *b.* The *sub-acute* states of tetanus require similar means to those already mentioned, prescribed appropriately to the features characterising individual cases. In these, as well as in the acute, the symptoms or signs of inflammatory action in the nervous centres or their membranes should be assiduously looked for; and if they be observed, the treatment ought to be directed accordingly. In this form of the malady, as well as in others, the most powerful agents are not always or even generally the most efficacious in arresting or controlling its course. Mild remedies, when appropriate in their operation to existing pathological conditions, especially when they are absorbed into the circulation and correct morbid states of the blood, or when conjoined with either of the several sedatives or narcotics noticed above (§§ 95, *et seq.*), are often more beneficial than the most heroic, more particularly in the milder forms of tetanus, in which it is often doubtful whether these latter are more injurious than serviceable.

114. It should always be recollected, that a judicious succession, as well as combination, of means is required for the cure of a disease which is so violent, so distressing, and so rapid in its course, as the acute forms of tetanus are; and we accordingly find in the histories of cases furnished by writers that such a succession and combination have proved the most successful. Gilmore had recourse to blood-letting, and administered calomel with camphor, soda, and brisk cathartics, followed by tonics and narcotics. Woodford prescribed blood-letting, calomel, Dover's powder, blisters, terebinthinate enemata, and the solution of tartarised antimony in frequent doses until it produced nausea, fœtid and black evacuations having been procured by means of the antimony and the turpentine injections, relief was then obtained. Several writers have observed the beneficial effects of large doses of the alkalies with opiates or other narcotics, after bleeding, purgatives, and other suitable means have been used. Dr. Smith, after the operation of purgatives, applied from fifty to sixty leeches along the spine and behind the ears; and as soon as the leeches fell off, he kept constantly applied, over the whole length of the spine, cloths wet with a strong solution of the muriate of ammonia. At the same time he administered the wine of the seeds of colchicum, commencing with half a drachm, and increasing the dose every half hour or hour, until it produced vomiting, when it was no longer given. Other authors have shown that, after a due recourse to blood-letting and purgatives, in this malady, very different means of cure may be of service, in different cases, as blisters along the spine, followed by poultices moistened by an infusion of tobacco, wine and opium being taken at intervals; or the

cold affusion on the occiput and spine, followed by warm coverings, hot wine, spices, and opiates, the affusion being continued until approaching syncope, and these measures being repeated upon a return of the spasms; or the extract of opium conjoined with camphor and nitre, or with tartarised antimony; or the injection of a solution of a watery extract of opium into the blood, in addition to medicines otherwise administered; or the injection of a solution of tartarised antimony into the veins; or the administration, *per anum*, either of this solution, or of the infusion of tobacco, or of tobacco-smoke. A recourse to several of these more energetic means, more particularly the injection of powerful agents into the blood, and the administration of tobacco or tartarised antimony, always require the utmost caution. The effects of these should be carefully observed during a considerable time after they have been employed, in order to ascertain the propriety of repeating them, and that no time may be lost in having recourse to measures to counteract any injurious effects which may appear from them.

115. *E.* The Prevention of Tetanus or Trismus can rarely be entertained by the physician, as the circumstances indicating the contingent occurrence of the malady in its idiopathic form are seldom sufficiently marked, and still seldomer come under his cognisance. But it is a very important consideration to the surgeon. Much of what I have advanced when discussing the treatment of Shock (*see that art.* §§ 19—28.) applies to the prevention of this malady after severe injuries. But the chief means of prevention consist in promoting the excreting functions of the skin, bowels, and urinary organs, and in supporting the constitutional powers when these appear to languish, or are inordinately depressed by the shock, or by other causes. A dry and temperate state of the air, due ventilation, and the removal of the patient from unhealthy or miasmatous localities, or from crowded dwellings and narrow and insufficiently drained streets, are of the greatest importance in preventing the occurrence of the traumatic forms of tetanus.

116. *F.* Convalescence from tetanus or trismus requires much care as respects the regimen and medical management of the patient. The secreting and excreting functions ought to be duly regulated and promoted whenever they become torpid. The functions of the skin should be facilitated by occasional warm baths, by frictions, and by regulated exercise in an open and healthy atmosphere. The digestive organs always remain long weak and irritable, and require the use of mild tonics with soothing or sedative medicines, as the bitter infusions with hydrocyanic acid, &c., and a light diet. As the digestive functions become restored, the more energetic tonics, or chalybeate preparations, and mineral waters, may be given, and a more generous diet be allowed.

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THERAPEUTICS, GENERAL PRINCIPLES OF—Physic, practical Principles of—Therapeia Generalis.

1. In the article Disease I have discussed — 1st. *The causation of disease, or Ætiology*; — 2nd. *The general doctrine of disease, or Pathogeny,—the several states of Morbid Action*;—3rd. *Diseases of the fluids, and more solid structures, generally originating in altered conditions of life*, especially in those previously discussed; — 4th. *The connection of Morbid Actions and of organic lesions with Morbid states of the Blood*; — 5th. *The Procession of Morbid Phenomena*; — 6th. *The Terminations of Disease*; — 7th. *The Relations, Alliances, Successions, and Complications of Disease*; — 8th. *The Mutations and Metastases of Disease*;—and 9th, and lastly, I have noticed, very briefly, *the Circumstances modifying the Form, Complications, Durations, and Terminations of Disease.* This article, in connection with those on the Blood, on Absorption (all written and published in 1831, 32, and 33), on Endemic and Epidemic Influences, on Infection, on Inflammation, and on Sympathy, constitutes a system of General Pathology, to which, although many years before the Profession, there is even now (1853) little of any importance to add, and in which I can find as little either to change or suppress. During this period, however, I have seen many of my ideas reproduced by others; and although I have been flattered even by this mode of adopting them, yet I have not had the honour of their paternity assigned to me. Of this I have reasonable cause to complain.

2. Having, under the above and other heads, considered the *Causes* and *Doctrines* of diseased actions, and the *Successions of Changes* following the predisposing, exciting, and accessary causes of disease, until either recovery or structural changes, and even death, ensue; and having, in the articles Auscultation and Symptomatology, and in others on the symptoms and signs of disease, discussed the phenomena and manifestations of general and special morbid action, it legitimately follows, that the *Principles* which should guide us in attempting the removal or alleviation of disease should be as fully developed and illustrated as the scope and limits of my work will permit.

3. In the articles on Endemic and Epidemic Influence, on Infection, on Protection from Pestilential and other Maladies, and in several other places, the most important and practical parts of Public and Private Hygiene have been fully treated of. Although the *prevention of disease* does not strictly fall within the scope of *therapeutical doctrine*, yet it is so closely allied to it as to warrant a reference to those places, where it is most appropriately considered,

in connection both with the causes which require prevention and counteraction, and with the effects which result when such precautions are not taken.

4. I. CIRCUMSTANCES RETARDING OUR ARRIVAL AT JUST PRINCIPLES IN THERAPEUTICS.—*A. Erroneous, limited, or one-sided views of the causes, seats, nature, and procession of disease — of medical doctrine* — are amongst the most influential means of retarding, and even of arresting, our progress in therapeutical knowledge, and in attaining to principles which may enable us to methodise that knowledge, and to advance its progress. The empirics and dogmatists of antiquity, the humoralists of much later times, the solidists and nervous pathologists of the last century, the doctrines of BROWN, the less philosophical and more limited views of BROUSSAIS, and other partial hypotheses, which never reached the dignity of being accounted theories, have set principles at defiance, and left reason out of consideration. Doctrines have been based on postulata; and what, in other hypotheses, may have been true of a species or variety, has been unjustly imputed to the genus or order. Inferences have been drawn from a few incorrectly observed facts; whilst assertions have been received as truths, and credulity has reposed upon them; worthless authority thus usurping the place of close observation and calm deduction.

5. *B. The neglect into which the vital endowment of the frame has fallen*, amongst modern pathologists, and the disposition to impute more to chemical and material changes than truly belongs to them, are also no mean causes of the retardation of the progress of sound therapeutical principles. The *vis vitæ*, the operations of Nature, constitutional power, vital resistance, &c., are terms which have been used synonymously with vital endowment; but whatever may be the name by which *vitality* should be recognised as a principle of our being,—as the chief essence or principle of existence,— it should always receive the first and chief consideration. Although partially or altogether neglected by many, and although results are imputed to other agents and causes which more especially belong to it, yet it on many occasions asserts its own rights, evinces its rule throughout its domain, and, whatever agents we may employ, and often even in opposition to injurious agents, it accomplishes those salutary purposes for which it is destined, and removes diseases which can be removed only by its influences. Whatever may be the object or intention with which medicines are administered, whatever the mode of prescribing them, the vital manifestations of the organ to which they are applied, or of the body generally, are more or less affected by them.

6. *C. Specious or novel plans or views, to which much greater importance is attached than they deserve* — Novelties, specious appliances, attempts at precision which cannot be reached, and various methods recommended by cunning persons to serve their peculiar purposes, and quickly caught up in order to serve the same ends, or to show extended information, severally tend to retard, and even to mislead, the march of therapeutical knowledge. The recent vaunting of the importance of medical statistics, and of numerical methods of proving the seat or nature of particular maladies, or the efficacy of particular remedies or plans of cure,— undue values put upon therapeutical agents, plans, or systems, —the vain parade of imported articles of medical belief, even although they may rank no higher than specious absurdities, are all impediments in the way of truth. A physician who has obtained by accident, by connection, or by talent of some kind, a position in his profession, asserts that a disease, or class of diseases, exists in certain numerical proportion, or presents numerically certain pathological changes or phenomena; and that the success of particular remedies or plans of cure may also be valued numerically as respects that or other diseases. The assertion, although so fallacious as to be almost absurd, yet being made by a physician of reputation or position, is believed, paraded as an astonishing novelty, and as an undisputed truth. Yet no hypothesis connected with medicine is more erroneous, inasmuch as there is not one disease which is always the same in all its features, in all places, or seasons, or times, or which is identical as to its precise seat, nature, or vital and material relations and associations. As there is not a single disease in the various and ever varying states of climate, of causes, of duration, of endemic or epidemic influences, of constitutional peculiarity, &c., that is identically the same, attempts at a numerical precision must necessarily be fraught with error, and be productive of most injurious results; the specious appearance of a precision which the nature of the subjects to which it relates cannot reach, or even approach, misleading those who prefer authority to deep thought, and a striking novelty to close observation.* This is only one of the several specious plans

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* There cannot be a more absurd belief than that confided in by some recent writers, who have adopted the numerical method, not only of describing the causes and symptoms of any particular disease, but also of treating such disease. Thus our Continental brethren, and our domestic imitators, having assumed that the disease is pneumonia, or pleuritis, or peritonitis, or any other specific form, without noting the influences of climate, season, age, constitution, endemic or epidemic conditions, duration, complications, &c., are not content with informing us that so many in the hundred presented a certain symptom, or proceeded from a particular cause, and that another number in this hundred furnished different results, but they go even further, and, endeavouring to enlighten us still more, tell us that a certain number per cent. of a certain disease was cured by one medicine, another certain number was cured by another medicine, the one which cured the most being *the* remedy for that disease; as thus most irrefragably proved by this most admirable statistical or numerical therapeutical method! Let me take a recent illustration of this most admirable method, as furnished by a most distinguished medical *savant*, somewhere between this and the Black Sea. He takes a large number of cases of a disease which he has assumed to be, or is pleased to call, *pneumonia*, but of the truth of which we have no evidence, and none whatever of the causes, of the characters, of the duration, of the morbid associations or complications, &c.—no proof whatever whether or not they were cases of sthenic, or of asthenic or congestive pneumonia, or of broncho-pneumonia, or of peripneumonia. He represents these numerous cases as pneumonia, although it is well known that pneumonia presents very different and even opposite features, and conformably with such features requires very different and even opposite means of cure, —means varied and appropriate to each case and to each state and stage of the malady. But the enlightened and illustrious therapeutist makes short work of his numerous cases. True to his faith in numbers—to his infallible "numerical method," he divides his devoted, although numerous cases into three equal parts. These three equal numbers — these three forlorn hopes, which thus are led to storm the stronghold of scientific and rational medical practice—are each very differently treated: one devoted third is treated by blood-letting alone; ag-

or novelties which the love of notoriety, or the desire of distinction, has thrown out to the credulity of the multitude, each one having its own crowd of believers, until another supersedes its supremacy for a time,—until it, in its turn, sinks under the influence of a successor, the revolving wheel of time at last turning up anew the theories, the plans, and the beliefs of past ages.

7. *D. Wrong estimates of the efficacy of particular medicines and agents* are as influential in retarding the progress of therapeutical principles, as the adoption of erroneous doctrines of the causes, seats, or nature of disease. Therapeutics is based equally on sound pathological principles, and on a knowledge of the operation and efficacy of medicine — of the instruments which we employ for the removal of morbid conditions. It requires not the lapse of many years to show the experienced physician the perishable reputation of many of the agents which have been employed against disease. Worthless agents have often been adopted; means which possess little influence have been over-estimated; and others which are efficacious when judiciously used have sunk below their true value, or even fallen into disuse. Fashion, undue estimates, improper and irrational employment, have contributed their respective shares in retarding our knowledge of therapeutical agents, and in preventing us from accomplishing therapeutical intentions. The same revolutions which have taken place in respect of medical doctrines during many centuries have likewise taken place as to therapeutical agents; the vanity of some, the cupidity of others, and the sanguine or enthusiastic views of a few, leading those into error who trust to authority, and who are deprived of the means or the powers of original research and profound observation.

8. *E. The licence allowed by the laws to charlatans, impostors, and systems of imposture*, and the credit which these obtain with the public, owing to the confidence of their assertions and the false testimonies they produce in support of their delusions, are injurious to the progress and reputation of scientific medical practice. The cure of disease being essentially a most important and high profession, all who pretend to it receive from the public an amount of notice great in proportion to the parade, rather than to the justice, of their pretensions. Hence the high standard of medical profession is lowered; and every pretender, whilst he detracts from this standard, derives to himself a reputation with the credulous public which is altogether opposite to his deserts. These impostors, by assuming characters which do not belong to them, and which the negligence of the legislature, and the worse than negligence of the expositors of a most imperfect legislation, not only permit, but even encourage, by thereby lowering the prestige of medical science, and by diminishing the amount of encouragement held out to learning and science, actually retard the progress of scientific research, of professional learning and observation, and consequently of practical medicine.

9. *F. But the most remarkable cause of the slow progress of therapeutical science is to be found, in the highest and most legitimate ranks of the medical profession — in physicians themselves.* — Public institutions for the cure of disease, in very few instances in this country, and, even there only in recent times, have furnished the amount of knowledge to the profession which they are calculated to furnish; and many of those, who have been engaged for the greater part of their lives in treating the diseases received into the wards of these hospitals, have gone to their graves either without having thrown any light upon the obscurities of pathology and of therapeutics, or, if any such light had broken in upon the darkness of their mental vision, it had never been reflected to others, or enlivened the gloom in which they had shrouded their ignorance. Other physicians have enjoyed the patronage not only of the public but also of their profession, and must have had their minds stored,—if, indeed, capable of obtaining and retaining such stores,—with pathological and therapeutical knowledge, and have sunk into the tomb without furnishing a single fact, precept, or opinion, by which their names could be rescued a single day from their deserved oblivion. Thus the springs of therapeutical science have either been dried at their very sources, or have been absorbed by the barren and sandy soils through which they had most unfortunately passed. Others, with a more determined selfishness, reserve to themselves, and to their own uses, and for their prospective gains, the results of the experience they may have reached, and of the researches they may have made; and, without reflecting that the attainment of knowledge imposes the duty of imparting that knowledge to others, as a grateful return for the kind Providence of attaining it, do all in their power to turn it to their own advantage, and to prevent it from coming before the profession or the public. This last cause, however, of the retardation of therapeutical knowledge is much less remarkable than formerly, and is rarely to be observed at the present day.

10. *G. The want of correct ideas as to the physiological action of remedies* is one of the most powerful causes of the retardation of therapeutical knowledge. It is obvious that, even when the causes and nature of a disease are clearly indicated and recognised, if the physiological action,—the *modus operandi*, of the agents prescribed be not accurately known, the indications of cure cannot be successfully fulfilled, unless, indeed, the vital resistance of the frame be such as overcomes the injurious or wrong-directed means. Hence the propriety, as will be shown in the sequel, of ascertaining with precision the true action of the means employed—of using aright the instruments of cure.

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other devoted third, by tartar emetic only; and a somewhat more fortunate third is left entirely to the unaided efforts of Nature. Can there be any doubt of the result, when we know well that many cases of pneumonia, instead of blood-letting, or tartar emetic, in which cases these means are certain destruction, require camphor, ammonia, and other remedies very different from those he has experimented on? What this empyrical admirer of the "numerical method" inferred, when he found that Nature was the best doctor, may not be manifest. But she is undoubtedly very greatly to be preferred to the *soi-disant* physician, who treats disease according to the name he chooses, often irrationally, to give it; and without adapting or combining his agents in such modes as an enlightened physician would employ and direct them to the removal, the counteraction, or to the relief, of such existing morbid actions as pathological science would enable him to detect and estimate with due accuracy.

11. *H. The prejudices, also, of those who are submitted to medical treatment, and the neglect of others,* although chiefly preventing the success of treatment, likewise retard the advance of this department of medical science. Many persons submit to treatment to satisfy their friends, without belief in its efficacy, or at least with a conviction that medical care cannot avert their fates, or change the decrees of Providence, not knowing, or not believing, that the means are required to be used by us before the blessing of the Almighty can be accorded to them; and that those are most certainly aided by Divine power who use every endeavour to aid themselves, whilst those who mistrust their own, and other human efforts, most frequently reap the fruits of distrust and unbelief. The neglect of patients themselves, although confiding more or less in medicine, to follow out with care the injunctions of the physician as to its use, and as to diet, air, exercise, and regimen, often mislead him as to the operation and the success of the means which he has prescribed, and induces him to attribute either too little or too much to their influence.

12. *I. Medical jealousies and contentions; opposing systems, plans, or means of cure; jarring views as to the efficacy or operation of certain medicines; opposite opinions in courts of justice, or otherwise appearing in public; the publicity given to medical discussions,* especially when different views are warmly espoused, have severally and collectively an unfavourable influence on the public, especially at the present day, and prevent many from trusting to medical treatment, at least for such a period as is requisite for their cure. These circumstances induce many to have recourse to charlatans, whose confidence and assurances impart a similar sentiment in them. The impatience, also, of those who ought to be patient; the frequent changes of their medical advisers, and the consequent discordance of their views and of their means of cure; the recourse to new plans or agents before those previously employed had received due trial, or their effects observed, together with various other circumstances depending upon both physician and patient, and with the too frequent incongruity of the means prescribed, not merely retard or prevent the recovery of the patient, but also exert a similar influence on the progress of therapeutical science.

13. II. The Principles of Therapeutics. — My limits prevent me from noting the earliest attempts to develope the principles of therapeutics, or the more recent efforts at a satisfactory arrangement of these principles. The reader who is desirous of satisfying himself as to these matters, may do so by referring to the works enumerated in the Bibliography. Without adopting, or in any way following, the methods of others, I shall draw upon my own resources, and state what extensive observation and prolonged experience have induced me to believe. Although on this, as on many other occasions, I furnish the references for those who choose to have recourse to them, yet the opinions or doctrines which may be there found, and those which will be here enunciated, if they agree at all, or in as far as they agree, may be viewed as accidents or coincidences, and as evidences of their truth, rather than that I have been indebted for them to any of the sources there indicated.

14. i. Fundamental Principles of Therapeutics — The essential Basis of Therapeutics.—*A. To endeavour to interpret aright the operations of Nature, and not to interfere with them when their procession is conducive to the removal of morbid states, or to a return to health, but to aid and to develope them when aid is required.* — This precept is evident to all observing and experienced minds; but it is not always adopted by the inexperienced. When a person is seized with epistaxis, or with vomiting, or with diarrhœa, or with a hæmorrhoidal discharge, inexperience may attempt to arrest it, and thus to change a salutary evacuation to a dangerous malady. If these were duly watched, the effects carefully observed, and allowed to proceed, either until they subsided spontaneously, or until it became obviously requisite to arrest them, cerebral congestions and determinations, hepatic obstructions or congestions, or other serious affections, which often follow upon their premature arrest, might be averted. It not infrequently occurs, that either of these discharges, especially when scanty, or insufficient to produce a salutary effect, points the path which should be taken. Where Nature directs, we should follow; and, although her steps may not be exactly those in which we should always tread, the principles she inculcates ought to be adopted, and carried as far as an enlightened experience, or a reasoning observation, will warrant.

15. *B. We should next endeavour to ascertain the causes, the mode of accession, the duration, and the extrinsic and intrinsic circumstances influencing the progress, of the disease.* — *a.* It is obvious that the nature of the *cause* will always most materially influence the state, course, and termination of the malady. The cause often becomes identified with, and forms, as it were, a portion of the constitution of the disease. A poisonous seminium, emanated from an infected person, impregnates the frame of another, imparts a specific character to the resulting malady, in all its successive and spreading disseminations. Malaria invades the frame, and produces effects commensurate with the concentration or dose of the poison and the susceptibility of the individual. The inflammations resulting from the more usual causes of suppressed perspiration, or of interrupted eliminating processes, manifest different features from those which result from special animal emanations, or other poisons: whilst the former are more or less sthenic or limited, the latter are spreading, erysipelatous, contaminating, or infectious. (See *Arts.* Endemic and Epidemic Influences, Erysipelas, Infection, Poisons, &c.)

16. *b. The mode of accession* is often an index to the future character and course of the malady. If the accession is clearly connected with the cause, and such as the cause usually produces, both the nature and the treatment of the disease are often clearly indicated. Thus, if a person experiences chills or rigors, but complains of no remarkable pain or other affection of an organ lodged in any of the cavities, although there be pains in the head, back, and limbs, and if he can trace his disease to exposure to any of the usual sources of malaria, either intermittent or remittent fever may be considered as having commenced; and if, after such rigors and such exposure, heat

of skin, vascular reaction, and the other usual symptoms of febrile excitement be present, the nature of the malady becomes still more manifest, although a further time, probably only a very few hours, may be required to demonstrate the type of the malady. In such cases, an emetic, followed by a chologogue purgative, and by free evacuations, and these, at the due period, by a powerful dose or doses of quina or of cinchona, &c., will make a salutary impression on the frame, will break the chain of morbid actions, and prevent the succession of febrile paroxysms. This connection of the cause with the accession of the disease it produces, is still more remarkable in respect of specific and infectious maladies, and often not less so as regards endemic and epidemic diseases, and often furnishes a sufficient basis for therapeutical intentions.

17. *c. The duration of the disease*, when the physician is first called, and the previous history of the case, obtained with all possible precision, are essential to a proper treatment of it. The stage at which it has arrived; the existing pathological conditions, as far as they may be traced; the probable degree of vital power or resistance; the evidence as to the state of the blood and of the depurating organs and functions; and the means which have been already employed, and the effects produced by them, should be severally estimated with all the accuracy in our power. It is obvious that, as disease is generally a succession of morbid actions, leading either to the restoration of health, or to exhaustion of vital power and deterioration of the fluids and structures, so should the progress in either direction be carefully considered, and the indications and means of cure directed accordingly.

18. *d. There are numerous intrinsic and extrinsic circumstances influencing the character and tendency of a disease* which ought to be duly considered by the physician, inasmuch as a recognition of these, and a careful estimate of them very often, should direct or modify both the indications and means to be adopted. I can merely enumerate these circumstances at this place, as a more full consideration has been given them under different heads. The several *epochs of life*, from infancy to extreme old age, not merely have diseases which are especially incidental to them, but also very remarkably modify the features and tendencies of those which are common to all ages. (See *Art.* Age.) — The *temperament* and *habit of body*, particularly as respects vascular fulness and inanition, or anæmia, are of great importance, as I have shown in the article Blood (§§ 13—77.). *Varieties of the human species* and *differences of race* very remarkably influence not only the predisposition to, but also the treatment of, many diseases, especially those of a febrile, inflammatory, and epidemic nature; and when individuals of any variety or race have migrated from a climate in which they were indigenous, to one more or less different in the several physical elements and circumstances which constitute *climate*. The pathology and treatment of diseases, with reference to difference of race or variety, was for the first time duly considered in this work. The *occupation* of the individual not only induces many diseases, but also modifies others. (See Arts and Employments, &c.).—The *habits* and *mode of living* usually adopted by the patient both modify the character of many of the diseases to which he is liable, and require modified indications, means of cure, and regimen. They are even productive of several others, as fully shown in the article on Disease (§§ 18, *et seq.*). In addition to these, certain Diatheses and hereditary diseases should not be overlooked, and, of the former, the Scrofulous, the Gouty, and the Rheumatic, are the most important.

19. *Mental impressions, emotions*, &c. have a powerful influence in modifying, as well as in predisposing to, disease; and this influence is very generally exerted during the whole course of the malady, favouring, and sometimes even occasioning, an unfavourable or a favourable issue, according to the nature of such impressions or emotions. These affections of mind ought always to be duly considered by the physician before he forms his indications or selects his means of cure. In severe, dangerous, and infectious maladies, the patient often entertains anticipations of the result, which occasion their own fulfilment. When these anticipations are unfavourable, and especially when they amount to convictions in the patient's mind, then they should be combated not only morally but physically. They should even direct the indications and the means of cure, the most powerful remedies being then required to rouse the vital powers and resistance, to arrest exhausting discharges when these are present, and to restore the depressed energy of the organic and cerebro-spinal nervous systems. Several slighter and more chronic maladies either are rendered more severe, or are prolonged, by mental disquietude or anxiety, — by some cause depressing or irritating the sentiments, emotions, and passions. The mental condition and circumstances of a patient should, therefore, be ascertained, when the state of disorder indicates any disturbance in this direction, and ought to be directed accordingly.

20. *Several extrinsic influences* modify the character, nature, type, and terminations of disease, not merely in as far as they are the occasion of it, but chiefly by the impression they make on the frame during the course of the malady. *Climate* remarkably affects the prevalence and nature of many diseases; and requires that the indications and the means of cure should be directed and modified accordingly—and with reference not merely to those persons who are indigenous and acclimated, but also to those who have recently undergone a change of Climate. (*See that Article.*) Endemic and Epidemic Influences (*see these heads*), confinement in an infected atmosphere, or in crowded or ill ventilated apartments and localities, emanations from burying-grounds, sewers, drains, cess-pools, or water-closets, and the numerous sources of atmospheric contamination described when treating of the causes of Pestilence and of the means of preventing it, severally not only produce disease, but aggravate its character when the patient continues to be subjected, during its progress, to any of these causes.

21. *States of weather* and *season* have also great influence upon the course of diseases, certain ranges of temperature favouring the occurrence of some diseases, or even being necessary to the diffusion or to the infection of others; especially of infectious, pestilential, and epidemic maladies. The influence of season, weather, winds, and, more es-

pecially, of ranges of temperature, not merely on the diffusion of disease, but also upon its general character, is so well known that it is unnecessary to furnish any illustrations of the fact at this place, as they are fully adduced, under their respective heads, when treating of the maladies chiefly influenced by these causes, and in the articles Disease, Infection, &c., and in those just referred to.

22. Amongst other influencing extrinsic causes, the *prevailing epidemic constitutions*, as well as those just mentioned, and generally in connection with them, require strict attention when forming the indications, or selecting means of cure. These epidemic constitutions often continue many years, and the prevailing diseases present either a high range of sthenic diathesis, or a general asthenia, or depression of vital resistance to the progress of morbid changes. In the former, the character of diseased actions is sthenic, inflammatory, and recuperative; in the latter, it is adynamic or deficient in vital power. The sources of these prevailing constitutions have not been satisfactorily shown. They have been imputed to a prevailing character of the seasons, to the annual amount of rain fallen during a series of years, and to the states of terrestrial and atmospheric electricity—to either or all of which they may be referred, although the proofs respecting them are not quite conclusive; and are not sufficient to exclude the influence of other, or even of unknown agencies.

23. *C. To determine the pathogeny of disease—to ascertain existing pathological conditions, and the morbid tendencies characterising them*, is the chief basis on which indications of cure should be founded. This is the great *axiom* in rational therapeutics, and, unless due regard be paid to it, medical treatment is worse than empyrical:—it is often destructive of life,—it entirely subverts its own intentions. This being the case, the utmost care should be taken to arrive at accuracy respecting these conditions, and as to their several tendencies and consequences if they be not arrested or controlled. Due consideration ought likewise to be given to those topics which have been already discussed. The existing pathological states having been rationally inferred from every fact and circumstance connected with the disease, and from its causes and modifying or accessary influences, the indications and means of cure should be appropriately directed to remove, or to control, or counteract them, according to their natures and tendencies, as shown in the more *special principles of therapeutics* (§§ 36, *et seq.*), and fully illustrated in the consideration of the specific forms of disease, under their several heads.

24. *D. To remove all predisposing, exciting, and concurring or accessory causes, as far as may be in our power*, is obviously necessary to the removal of the effects resulting from these causes. The causes of disease, especially those which are exciting or most influential, are often so obvious, and their connections with their effects are so demonstrative, that the existence of the former leads us to infer the latter; and a due manifestation of the latter is indicative of the former. This is especially the case in respect of specific, infectious, contagious, febrile, endemic, and epidemic maladies. But there are other diseases which are the effects not of one or even of two causes merely, but of several. There are numerous circumstances which influence, by predisposing or by counteracting, the susceptibility of the individual to the invasion of the exciting or efficient causes of disease; whilst there are many more which concur or reinforce these causes, either at the time of, or subsequently to, their morbid impression and action. Some of these may escape detection or due estimation, whilst others may have an undue importance assigned to them. Still it should be our strenuous endeavours to ascertain their existence and influence with due precision, in order that they may be removed or counteracted.

25. ii. General Therapeutical Principles and Precepts.—*A. Of indications and contra-indications in the treatment of disease.*—Indications or intentions of treatment or cure are those objects or ends which we propose to attain, in order to remove altogether, or to alleviate disease when removal is no longer attainable, owing to its nature or progress. Contra-indications are such intentions or means which would, reasoning from existing phenomena and pathological states, either not remove or benefit these states, or would aggravate them, and thereby risk the life of the patient. Indications of cure are to be accomplished or fulfilled appropriately and successively, by a careful and accurate deduction from existing morbid conditions and tendencies, and with a strict reference to the fundamental principles noticed above, to facts, and to the considerations and reasonings which accurately observed facts suggest. Having observed with care and acumen, and drawn rational indications from a close and comprehensive view of both the intrinsic and extrinsic circumstances of the case, the next object is—

26. *B. To employ agents or means,—remedies or medicines,—for the fulfilment of those indications or intentions that are the best calculated to this end.*—But to attain an object, to accomplish an intention, it is most requisite to entertain accurate views as to the mode of action, the proper methods of employing, and the efficiency of, the agents, instruments, or means which we may recommend. The physiological action of medicines, in different doses or quantities, ought to be known, and the operation of the same medicines and doses be ascertained, in different diseases, by a careful experience and close observation. Having previously known the modes in which agents or means become remedial or instrumental against disease, those agents or medicines should be employed with strict reference to the removal of existing morbid states, as far as they may be ascertained, and with the intention of preventing progressive disorder, a strict regard being always had to the physiological and pathological operations of these medicines or agents.

27. *C. To closely observe the states of vital power and resistance, and the grades and character of vascular action, in connection with the condition of the circulating fluids and of the several secreting and excreting functions.*—Our means should always have regard to the vital manifestations, recollecting that agents become remedies only when acting on vital states, and appropriately to a correct interpretation of these states,—when they calm or lower vital excitement, or morbidly increased vascular action, if either of, or both these pathological conditions are present, and when they

restore vital power or impaired vascular action, if either of, or both these states require restoration. But it is not only necessary to attend to the grades and character of vital power and of vascular action and reaction; the conditions of the circulating fluids, and of the secreting and excreting organs, should be ascertained with all possible accuracy. The condition of the circulating fluids, especially of the blood, can often be inferred only from the activity, from the torpor, or from the suppression of one or more, of the eliminating or depurating functions, and from the appearances of the skin, extremities, and the outlets of mucous canals; it may be further inferred, on many occasions, from the states of the heart's action, and of the pulse, in connection sometimes with the appearances and the changes of the blood itself, when taken from a vein. Whatever may be the changes, the signs, or the phenomena which may guide our inferences as to vital power, or to vascular action, or as to normal or anormal conditions of the fluids or solids, these inferences having been rationally drawn, the indications of cure conclusively follow, and are to be fulfilled by medicines selected conformably with their known operations.

28. *D. To take into consideration not merely the states of vital power, of vascular action, and of the excreting and depurating functions, but also the diathesis, the general aspect, the complexion, the posture, the nutrition, and the physical power of the patient.*—In addition to these, the circumstances in which the patient is placed, and by which he is influenced, whether mental or physical, — whether intrinsic or extrinsic, — should be duly estimated conformably with the influence they may severally or collectively exert in favouring, or in counteracting, the indications and the means of cure; and these means should be selected with due reference both to these indications, and to these moral and physical circumstances which are never present without influencing, more or less, the present condition, and the course and the terminations of the disease; and, moreover, without modifying the effects of remedies.

29. *E. To select the means of cure with strict reference to what is known of their modes of action, and, conformably with this knowledge, to employ them appropriately to inferred pathological conditions.*—Medical agents are remedial only as they are rationally or appropriately prescribed. In order that they may be so employed, it is requisite to bear in mind the following propositions:—1st. That medicines should be given in forms which may best produce their desired effects; — 2nd. That the vehicles in which they are given, should also possess this property;—3rd. That the substances with which they are associated, ought to be such as either will develope their effects, or will concur in producing the same effects;—4th. That substances which act upon more than one function, surface, or viscus, ought to be cautiously prescribed, and with especial reference to the function or viscus on which their operations are desired; — 5th. That when medicines are likely to occasion nausea, pain, or distress, these effects should be avoided by combining them with substances which may prevent or correct such discomforts; — 6th. That, when it is desired to influence more than one organ or system, agents whose actions have been shown to be thus complex, may then be selected with these intentions, or several may be conjoined with these views, provided that they are chemically compatible, suitable to the ends proposed, and altogether congruous with each other; — 7th. That the combination of medicine producing different effects, often occasions additional effects, different from those produced by either, and frequently without materially disturbing the action proper to each. These propositions, although almost self-evident, require a few remarks for their elucidation. My limits, however, require that these remarks should be very brief.

30. *a.* The form best suited for the production of the effects of a remedy, is that which conveys either all, or the greatest amount, of the properties characterising the remedy, and which presents these properties in the most suitable state for their immediate, or for their more protracted operation, as either may be required. Thus the more immediate and full operation of medicines is most frequently obtained by infusion or decoction, by dilution, or in the state of tincture or essence, according to the nature of the substance; or by trituration or minute division, if the substance be more or less solid. In the states of solid, and extract, or in the form of pill, many substances either may long remain in the stomach without being acted upon, or may pass the pylorus, and either occasion a very delayed or a very imperfect effect; and when pills are gilded or silvered, their operation may be still longer delayed, or they may pass off without being dissolved. When the operation of medicines upon the lower bowels or uterus is desired, then the form of substance, extract or pill, may be preferred.

31. *b.* The vehicles best suited for the administration of active medicines, should be congruous with the operation of these medicines, and such as may prevent the stomach from being disturbed by them, and at the same time promote their operation. Thus the action of the disulphate of quina is promoted by taking it in the compound infusion of roses; the tinctures of cinchona, in the infusion or decoction, or in an aromatic water; the several tonic tinctures, in bitter and aromatic infusions; and the purgative tinctures or salts, in laxative or purgative infusions; neutral salts, in states of much dilution; powders, in aromatic infusions or waters; and the active ingredients for enemata, in vehicles which will admit of their administration in due or equal admixture.

32. *c.* That several substances whose effects are congruous, or calculated to develope their mutual actions, are often most beneficially prescribed together, cannot be controverted, especially in cases requiring a decided operation on the secreting and excreting organs, and a due development of the several vital manifestations. Thus various purgative or cathartic substances are combined with advantage; several stimulants, with antispasmodics; tonics, with stimulants and aromatics, &c. Quina, or the disulphate of quina, is advantageously given with camphor, in many cases requiring the former; or cinchona with ammonia, or with serpentaria, or with both; or myrrh with assafœtida, galbanum, or ammoniacum; or infusion of vale-

rian, with tincture of sumbul, or with ammonia, or the æthers; the preperations of iron, with those of quina, or with those of calumba or quassia; the preparations of scoparium, with those of taraxacum, juniper, &c., or these with the salts of potash, &c., or with diuretic spirits or tinctures, &c.

33. *d.* It is often desirable to have recourse to substances which affect more than one function, or to combine medicines which affect different organs, due regard being had to the function requiring to be chiefly acted on. Certain medicines, particularly those which are alterative, and more or less specific in their operations, produce, according to their doses, the frequency of their repetition, and the nature of the disease, changes in more than one organ or function. Mercurials, antimonials, iodine, and the iodides, sulphur, magnesia, and the alkalies, &c. may be adduced in illustration of this position. Whilst sulphur acts on the bowels, it is partially absorbed into the blood, and acts also upon the skin, increasing both the cutaneous exhalation and the follicular secretions. Magnesia opens the bowels, is partially absorbed, and neutralizes and counteracts excrementitial materials in the circulation. Alkalies and the iodides combined with alkalies, affect the blood, and through it the several emunctories and solids. Camphor passes into the circulation, affects the nervous system, and promotes exhalation from the lungs and expectoration; the terebinthinates also are absorbed, and act upon the capillary circulation and on the kidneys, &c. Many of the neutral salts act upon the bowels; and being absorbed, especially when taken in doses which are not purgative, excite the kidneys to increased action, and sometimes also the skin, &c.

34. *e.* The action of medicines may cause discomfort or painful symptoms, which should be prevented or counteracted by adding substances which will correct these unpleasant effects. Purgatives, especially those which are cold, saline, or nauseous, and substances which in large doses occasion vomiting, frequently are rendered both more pleasant and more active, by conjoining them with aromatics, or with spices, or with bitters, or with both, and sometimes also with anodynes or narcotics; or by giving them in finer divisions, or in more diluted states, either similarly combined, or in smaller and more divided doses.

35. *f.* Medicines possessed of different properties may be conjoined, when it is desirable to affect more than one function, organ, or system; provided that the action of the one substance does not counteract that of the other, and that they are chemically and vitally compatible with each other. Thus the alkalies, the combination of them with boracic acid, or common borax, the nitrate of potash, magnesia, and the citrate of magnesia, severally change the states of the blood, especially when uric acid or the urates and fibrin are in excess in the blood, or when this fluid is loaded with excrementitial materials. They neutralise these materials, and promote their removal by means of the emunctories; and, when they are conjoined with tonics, or with febrifuges, or with bitter infusions, they promote the salutary effects of those, especially in periodic and low fevers, more particularly when they are given in the decoction of cinchona with serpentaria, or with camphor, arnica, &c. Those deobstruent and alterative substances, or the iodide of potassium, with the solution or the carbonate of potash, and with the tonics now mentioned, are also most beneficial in several states of rheumatism and gout, in some diseases caused by malaria, and in several other maladies, chiefly owing to the combination of means and to their conjoint actions.

36. *g.* The combination of medicines possessed of different properties, often gives rise to different or to additional effects, those characterising each either still appearing, or being masked by the effects resulting from the combination. Sometimes the effects are a combination of those produced by each ingredient, as when tonics are combined with aperients or purgatives. The true Dover's powder, or the association of ipecacuanha and opium with the nitrate of potash, produces an effect beyond those which characterize these constituents; yet their individual properties are more or less manifested. Disulphate of quina, conjoined with one-tenth of the quantity of aloes which is usually required to open the bowels gently, produces a cathartic operation. Small doses of opium tend to determine the action of medicines, which are apt to disorder the stomach or bowels, to the skin or to the kidneys, as when they are conjoined with antimonials, or with ipecacuanha, or with colchicum, or with the common diuretics.

37. III. Special Therapeutical Principles —The special consideration of therapeutical principles has been partly discussed under other heads; but it may not be without advantage to bring the whole subject, in a full and connected manner, before the reader, referring him to those places in which certain topics are as fully considered and illustrated as the scope and limits of this work will permit, in order that repetitions may be prevented both in this and in other places.

38. i. The Restoration of Nervous and Vital Power, when primarily depressed, is very often necessary; and the physician is called upon to accomplish this intention in a great variety of circumstances,—in cases of mental and physical Shock (see that Article); after the impression or action of numerous sedative, poisonous, or noxious causes; upon the invasion of any of the several infectious and pestilential maladies; in the cold stage of periodic fevers; and in the several forms of local or general Debility (§ 5, *et pluries*). In these, and even in other circumstances of disease, either the organic nervous energy, or the vital power generally is more or less depressed; but this may not be the only morbid condition. It may be associated with others in various grades, equally requiring attention and removal; but when it constitutes the prominent or chief affection, the others may arise from and depend on it, and the vital depression then imperatively requires removal. When the depression is a primary effect of known, specific, or poisonous causes, the continuance of it may then be followed by one or other of three results:—1st. It may become more and more urgent, or may increase until the vital manifestations entirely cease; —2nd. It may be followed by imperfect or abortive efforts at reaction, life at last sinking in the struggle;—3rd. When the vital energies are not subdued in either of these modes, reaction of a

tumultuous or excessive kind may supervene, and endanger the integrity of the structures or organs most predisposed to organic alteration. These results are the more likely to occur, when specific, infectious, or poisonous causes occasion the primary vital depression; inasmuch as the functions of the secreting and excreting organs are then early impaired or interrupted, or entirely suppressed, and the blood and other circulating fluids are more or less altered, contaminated, or poisoned. In this, as well as in other states of disease, the Indications are:—1st. *To ascertain and to prevent the further action of the causes occasioning vital depression*;—2nd. *To remove the effects already produced*;—and 3rd. *To prevent or counteract contingent or consecutive results.*

39. *A.* The *first* of these, although not always possible, may often be accomplished. A contaminating air may be corrected by ventilation, or by removing either the sources of contamination or the patient from their influence. But a specific infection or contagion, having once made its morbid impression, cannot be prevented from producing the succession of changes which characterise its effects, although these changes may be aggravated and vital power depressed by a humid, impure, or contaminated atmosphere; the second and third intentions are, therefore, to be attempted. Malaria, in any of its states, may have made its impression on the frame; and, although removed, the effects will take place in the form of vital depression, chills, rigors, &c., followed by vascular reaction, perspiration, &c. But if the patient were to remain during the progress of the disease, subjected to the continued influence of this cause, the disease would be more severe, more difficult to remove, and more prone to occasion structural changes in predisposed organs, and might even assume a more continued and dangerous type. There are numerous external or physical agents which depress the organic nervous energy, and through this system lower the vital manifestations; and there are many mental, and intrinsic, and even structural conditions which produce similar effects, without being clearly evinced or ascertained. In these circumstances, although the causes, and the changes which they have induced, may be loosely inferred; yet their removal or prevention may not be within our power, and the next indication is to be at once attempted.

40. *B. Secondly,* To remove the depression already produced, is an intention which should be fulfilled by means, as respects their powers and natures, appropriate to the grade of depression and the phenomena characterising it. But these means should have more or less reference, not only to the state of depression, but also to its causes — whether mental, physical, specific, infectious, &c. They ought to be sufficient for the end proposed; but not excessive in their operation, or such as are likely to occasion inordinate excitement or reaction, or irritation, or inflammation of the organs to which they are directed. In the more extreme cases, or when vital power is remarkably depressed by the invasion of infectious maladies, the more powerful stimulants are then required, aided by external measures, in order to determine the flow of blood to the external surface, and to relieve the internal organs from the congestion and vascular distension which oppress them, and which, without such means, the vital powers might not be sufficient to overcome. The invasion of several maladies produced either by malaria, or by infectious emanations, or by moral or physical shocks, is often attended by vital depression, characterised by a sense of sinking and of coldness; by tremors, rigors, or shiverings; by failure of the pulse, as respects either strength or frequency, or both; by a shrunk, cold, and bloodless state of the external surface; and by a feeling of oppression or of anxiety at the epigastrium and præcordium. These phenomena, when they are caused by malaria, are in most cases soon followed by vascular and vital reaction, unless in those circumstances and cases which are fully described in their proper places (See Fever, Intermittent, &c. §§ 33—35.). — In the more severe and congestive of such cases, retching or vomiting is generally added to the above characteristics of vital depression; and when the invasion of infectious and pestilential maladies — of exanthematous and other fevers, produced by their specific poisons, is attended by signs of vital depression, such as, or similar to, those now stated, there are generally also superadded retchings or vomitings, or both, evincing the more serious nature of the vital depression, and showing the efforts of Nature, not only to throw off the morbid cause, but also to resist the impression it has made, and to overcome the congestion produced by it in the large vessels and vital organs. In such dangerous circumstances, nature points the way to the fulfilment of the indication under consideration, and therefore it should be followed by promoting it by appropriate means, such as by warm, stimulant, and demulcent draughts; by external warmth and warm baths, containing salt, mustard, &c., and by stimulating and aperient enemata, in order to remove fæcal accumulations and depressing morbid excretions. The great question is, In these circumstances how far should the vomitings be promoted or allowed to proceed? This can be decided only by the effects produced and, by the quantity and appearances of the matters ejected; but generally, if the retchings or vomitings continue beyond the time apparently sufficient for producing a salutary effect, if the matters thrown off be scanty, serous, or sero-mucous, and if the vomiting be attended by an internal sense of heat at the epigastrium, and tenderness or heat over the region of the stomach, and by other gastritic or gastro-enteric symptoms, then, instead of promoting the vomiting, or of exhibiting stimuli, &c., the gastric irritability should be allayed by refrigerant or cooling demulcents, conjoined with sedatives; by external derivatives, and other suitable means. (See Art. Gastro-enteric Disease, and Stomach, Diseases of.) Nervous depression and sinking require for their removal the more diffusive stimuli, often conjoined with antispasmodics or with tonics, according to circumstances, and as shown in the article Debility (§§ 43, *et seq.*). The same symptoms which indicate the propriety of restraining retchings and vomitings, should also forbid the exhibition, by the mouth, of stimulants or tonics, which in other circumstances of vital depression, would be required, often liberally and frequently, but with due circumspection and regard to the effects produced, and to the peculiarities of the case; these

medicines also being selected judiciously, and according to an enlightened experience.

41. *C. Thirdly*, During our efforts to remove primary vital depression by suitable agents, due regard ought to be paid to the prevention of contingent or consecutive results of an unpleasant or serious nature; and when these cannot be prevented, they should be counteracted as far as possible. The internal congestions, which frequently occur during the vital depression directly produced by sedative infections and poisonous causes, frequently continue after efforts at reaction have been made; or, although partially removed, give rise to more or less disorder, especially when secreting or excreting organs have been thus affected. Not infrequently the viscera which experienced congestion during the primary depression, become, during the consequent reaction, the seats of a congestive inflammation or irritation. Hence the propriety of preventing or anticipating these results in the treatment employed to remove the primary morbid condition — of prescribing those means which are least likely to convert congestion into inflammation, and which, while they remove the depression, restore the vital manifestations in the several secreting and excreting organs, and promote the functions of these organs, especially of the skin, kidneys, and bowels. The contingent evils upon vital depression depend very much upon the depressing causes; and where these causes are specific, the effects are generally such as may be expected, yet they cannot be entirely prevented, or even always allayed or controlled. If the causes are concentrated, the susceptibility great, and the consequent depression extreme, the contingent congestion and consequent effects, although expected, may soon destroy life, however judicious the means which may be used. Numerous proofs of this are furnished us by the histories of the more malignant cases of remittent, continued, exanthematous, and pestilential fevers. In these the causes characterise the effects, and all the manifestations of these effects throughout the frame; but, although these effects necessarily result, well directed means may often allay or control them when they are excessive or dangerous. These means will necessarily depend upon the effects in the several forms of these maladies; and are such, as well as the particular effects they are employed to control, as can be discussed only under their specific heads, to which I must refer the reader.

42. ii. The Promotion of the several secreting and excreting Functions — of the depurating Processes, whenever they are torpid or impaired, has been just stated, as generally requisite to the prevention of many contingent evils, during states of vital depression by whatever cause produced; but it has a still more general application, for in all circumstances, and in all dynamic or other states of vital manifestation — in states of excitement and increased vascular action, as well as in those of depression — these functions are very often either torpid or impaired, or even interrupted, and require restoration; otherwise additional, or more severe and dangerous changes result, and the blood, loaded with excrementitial materials, occasions the most deleterious effects in vital organs. But the functions of depurating or excreting surfaces or organs are not confined to the mere elimination of injurious elements or materials. In connection with this depuration, the organic nervous fibriles, by means of the capillary vessels, affect more or less the state of the blood circulating in the capillaries, and impart to it a more complete organization as well as vital properties. The blood, in different parts of the capillary circulation — in the skin, in the respiratory mucous surface, in the digestive villous surface, in the structures of the several glands — by the influence exerted on it by the organic or ganglial nerves, through the media of the capillaries, thus varies, in vital properties and in sensible qualities, with the modified vital manifestations of the ganglia and their nerves; the functions of organs or parts owing not only their differences and specific characters to these modifications, but also the amount of their performance.

43. Next to the sedative or depressing effects produced by the causes of disease, the impairment or arrest of depurating functions closely follows, the latter being very frequently the consequence of the former. These functions are often, in these circumstances, restored by the same means as are employed to remove the primary morbid impression, especially by a judicious selection of emetics, and of diffusive stimuli, and by warm, hot, or medicated baths. In all cases — 1st. *The Causes which impaired or interrupted these functions should be ascertained and removed*; — 2dly. *The Means which the states of the several secreting and excreting functions require for their due promotion, should be prescribed, and generally with marked reference to the causes on the one hand, and to associated and contingent pathological conditions on the other.*

44. *A.* Suppression of the depurating function of the *skin* illustrates the importance of these intentions, whilst it shows the several pathological effects which may result from it. The great diversity of these effects, upon different persons, depend upon, — 1st. The existing susceptibility of the individual; — 2nd. The amount and duration of the cause; — 3rd. The predisposition of certain organs or tissues to be affected; — 4th. The vicarious increase of other excreting functions, diminishing or modifying the effects produced by the cutaneous suppression; — 5th The concurrence of other causes with those which suppressed the action of the skin. The suppression of excreting function being referred to its cause with all possible precision, the exact nature and amount of the pathological effects should be ascertained. If the function of the skin be further considered in connection with this subject, we find that its suppression may be followed, especially if the kidneys do not perform a vicariously increased function, by catarrh, or by rheumatism, or by inflammation of the lungs or pleura, or by diarrhœa, or by dysentery, or by enteritis, or by other maladies, according as the predisposition of parts may determine the morbid action. The cause or causes, whether exposure to cold or to influences depressing vital power, occasion, first, interruption of the depurating function of the skin, and, next more or less fulness or congestion of, or vascular determination to internal viscera or parts; and, in addition to this latter effect, and as a consequence of the suppression of the cutaneous function, the blood is loaded with these excrementitious elements which the healthy action of the skin elimi-

nates. The conditions of the blood and of the circulation resulting from the changes and circumstances just enumerated, are such in many cases as kindle disease, either those now mentioned, or others of a slighter or severer nature. The practical importance of tracing the causes and the succession of effects is further illustrated by the beneficial results which follow, when these causes are duly recognised, and the means of cure judiciously directed to the removal of the causes and the effects produced by them, and especially to the restoration of the impaired or suppressed function.

45. Still further, the treatment of any of the diseases mentioned above (§ 43.), when occasioned entirely or chiefly by suppressed cutaneous function, is legitimately based on the principle of restoring this function, and by its aid of removing injurious excrementitious elements from the blood, of soliciting the circulation to the external surface, and of diminishing the vascular determination to the seats of disease. The importance of attending to the depurating function of the skin is too frequently overlooked in the treatment of diseases, and in health, by all classes of the community. In the cases to which allusion has been here made, the means commonly resorted to, viz. warm and medicated baths and diaphoretics, suited to the nature of the disease and to the existing states of vital power and vascular action, are those usually indicated. But the appropriate use of these is to be acquired only by close observation and by an enlightened experience.

46. Not merely the restoration, but also the due preservation, of all the functions are most essential both to the removal of disease and to the continuance of health — more especially of the excreting functions; and those performed by the skin are not the lowest in the scale of importance. There are several practices connected with this function, in health and in disease, that have been too much neglected in modern times, although adopted among the ancients, and even by uncivilized communities at the present day; these are, anointing the surface of the body with oil; oleaginous frictions of the skin, especially after bathing; and the use of woollen or cotton coverings for several diseases, and whilst having recourse to diaphoretics. Frictions of the external surface with oil,—with olive, palm, or other vegetable oils, promote the excreting functions of the skin, protect the surface from the injurious impression of physical, infectious, and morbid causes, and tend to preserve a due supply and distribution of blood to the extremities and external parts; and these effects are the more manifest the more constantly they are resorted to, in connection with due ablution and bathing. The advantages also which result from lying in blankets or other woollen coverings, during the exhibition of diaphoretics, or when the depurating functions of the skin are being promoted, have been too generally overlooked in modern times, and deserve adoption in many diseases requiring an increase of these functions.

47. *B.* What has been said respecting the promotion of the *functions of the skin* applies likewise to the *other secreting and excreting functions.* Impairment or interruption of these, caused either by depressed vital manifestation, by lost or paralysed power, or by mechanical obstruction, requires the same indications of cure as have been stated above (§§ 39, *et seq.*), due regard being had, in the selection of our means, to the remote and the more immediate causes, and to existing and contingent pathological states. Of all the excreting or depurating functions, those performed by the *kidneys* are the most important, and most rapidly fatal when impaired, interrupted, or suppressed. But it is not merely impairment of this function as to the quantity of the excretion, but disorder of it as to the natural quality that also requires attention. Both conditions demand close observation, and furnish important indications for the treatment of disease, these indications being always derived from pathological states of most serious import, whether existing at the invasion, or in the progress, or towards the termination of disease. Mere deficiency of this excretion may require the use of means — of *diuretics* — suited to the vital conditions and to the states of vascular action; but the quality or chemical constitution of the urine, either independently of quantity, or in connection with the abundance of the excretion, excites the most serious considerations, both as to the vital powers, and as to the states of the blood and circulation, and urgently requires powerful alterative or constitutional remedies, appropriate to existing pathological changes. Illustrations of the importance of recognising alterations not only in the quantity, but also in the constitution of the urinary excretion, and of founding rational intentions of cure on these alterations, are furnished in the Articles on the BLOOD, on DISEASE, on DIABETES, on DROPSY, on the exanthematous and continued FEVERS, on diseases of the KIDNEYS, on the URINE, &c., to which I must refer the reader for the intentions and means of cure, when the functions of the kidneys are impaired, disordered, or interrupted, as to either the quantity or the quality of the excretion, and for the pathological causes and the consequences of such disorders of this excretion.

48. *C.* Impaired and interrupted excreting functions of the *intestines* and *liver*, are next in importance to those of the kidneys. Many diseases originate in, or are characterised by, at an early stage of their progress, defective excreting action of the liver and bowels—in neglecting to promote these depurating functions. It is believed by many that the regular and daily evacuation of the bowels is quite sufficient; but this may not always be the case, as to either the fæcal discharge, or the biliary secretion, or even as to both; and, although the former may appear frequent and abundant, the latter may be deficient, or altogether wanting. Hence the importance of observing accurately the appearances of the intestinal excretions, both in health and in disease, and of having recourse to such means as those appearances, the frequency of evacuation, and the associated states of disease will suggest. The several substances arranged as *purgatives* and *cathartics* should be suited to the peculiarities of each case, and be conjoined with others of the same class, or with such as may either correct or promote their operation. The general effect of purgatives is to leave the bowels more or less torpid after their operation has ceased. This will often be prevented by conjoining a bitter tonic with the purgative, as a preparation of gentian, or of cinchona, with that of senna, or the sulphate of

quina with aloes, the digestive canal being thereby strengthened as well as excited to increased action. These and similar combinations are often slow in operating, but they generally procure full and feculent evacuations, whether given in these simple states of combination, or with various alkaline or saline and stomachic additions. The various topics connected with torpor or inaction of the bowels, and with similar conditions of the liver, — with impaired excreting functions of the liver and intestines, — are fully discussed under the heads, Cæcum, Colic and Ileus, Colon, Constipation, Intestines, Jaundice, Liver, Rectum, &c., to which my limits oblige me to refer.

49. iii. To equalize the vital and vascular Actions throughout the Frame is a practical object, desired in all diseases in which vital manifestation or vascular action is inordinately expressed in, or determined to, any particular structure or organ; or in which vital organs are congested or oppressed. The entire accomplishment of the two preceding objects generally also attains this. Yet states of disease sometimes present themselves, or circumstances occur, which induce the physician to prefer such means as more directly act in this way — which equalize the vital and vascular actions. Indeed, most of those means act also upon the secretions and excretions, more especially on those of the skin, as when warm baths, warm diaphoretics, pediluvia, &c., are prescribed; and the very agents which are given to restore vital power (§§ 37, *et seq.*) have often the effect of equalizing the circulation and promoting the secretions. The means just now mentioned generally produce these complex effects, and others are often equally efficacious when employed in suitable forms and appropriately to pathological conditions. The acetate and other preparations of ammonia, the spirits of nitric æther, sulphur, warm or imperfectly conducting bedclothes, warm diluents containing diffusive stimuli, &c., have similar effects. In cases where local determination, or increased flow of blood, occasions either oppression, or augmented function, or causes defect of function in parts from which the vital or vascular action is derived, not only those means, but others of a more strictly *revulsive* or *derivative* kind, are often required, especially local depletions, dry-cupping, blisters, rubefacients, and other agents, whose operation is more permanent or continued, as setons, issues, and similar modes of producing *counter-irritation*, or even suppuration and vascular discharges. (See Arts. Congestion, and Blood, *local plethora and determinations of*, §§ 23, *et seq.*)

50. iv. To moderate excessive Secretion and Excretion, or to restrain excessive Discharges, is an intention requiring much acumen in the physician, to carry into safe execution. For the secretion or discharge may not be safely restrained or stopped. It may be a safety-valve opened by nature; and, when this is the case, it should not be closed without another having been substituted. When an attentive and a discriminating examination of the case shows that the discharge is productive of injurious effects, and requires either to be moderated or arrested; and when it is associated with other disorder, equally requiring to be removed, then such means as will have this effect, consistently with the nature of the secretion or discharge and with the existing state of vascular action, should be employed. Whenever an excessive or unnatural discharge is attended by increased vascular action, attempts to moderate, and far less to arrest it, should not be prematurely or hastily made, or, if made, they ought to be directed chiefly to the states of vital and vascular action. A nasal or hæmorrhoidal discharge of blood may prevent an attack of apoplexy or palsy, or of congestion of the liver or lungs. Any chronic or prolonged discharge, if abruptly arrested, may be followed by congestion or inflammation of the affected organ, or of an adjoining part, or by effusion into a shut cavity. Thus I have seen the sudden arrest of a copious leucorrhœa followed in different cases by congestion of the uterus, by inflammation of this organ, or by peritonitis, followed by copious effusion of serum. The same effects may also follow sudden arrest of a too abundant catamenial discharge. Whatever merely suppresses the morbid effect whilst the pathological cause or condition is allowed to exist, may be productive of bad or even fatal results. A chronic diarrhœa, if suddenly suppressed, without due attention having been paid to the appearances of the evacuations, to existing pathological states, and to the excretions from the skin and kidneys, or without either establishing a free derivation from the bowels, or determining the circulation to the surface, &c., may be followed by enteritis or peritonitis, with or without serous effusion into the peritoneal cavity. Epistaxis, if prematurely arrested, especially in persons of middle or advanced ages, or full habit of body, may be followed by an apoplectic, paralytic, or epileptic seizure.

51. In all cases of excessive or prolonged discharge, the nature of the discharge, and the changes from which it proceeds, require attentive examination; and these particulars having been ascertained, the treatment should be directed chiefly to the changes producing it. Many inordinate discharges, especially when acute or severe, or of sudden occurrence, cure themselves. As soon as the irritating secretion or accumulated excretions are fully evacuated, the disorder ceases, as in many cases of autumnal cholera or diarrhœa, and there remains only a slight irritation, occasioned by the morbid secretions, which either subsides, or is soon removed by promoting the functions of the skin, or by correcting morbid tendencies in the blood and digestive functions, or by other suitable means. Recourse to the more powerful *astringents* or *tonics*, without due regard to the circumstances just mentioned, or is often had, in cases of excessive discharge, to others of equal importance connected with the source of mischief; and in consequence of the use of these, the disease is arrested, and the patient thinks himself cured. But, after a short time, a different disease is manifested, one often more serious than its antecedent, and proceeds without the cause of its occurrence being sometimes suspected. Hæmorrhoidal discharges, or fistula in ano, especially when chronic, have been followed at some period, more or less remote from their cure by these or other means, by congestion of the liver or lungs, by hepatitis or pneumonia, or by ascites, or by increase of pre-existing pulmonary disease, as is most frequently the case.

52. v. To moderate or allay existing ner-

vous Excitement, or unnatural Function, or irregular Action, is an intention which the physician is often called upon to accomplish, in the present state of society. The successful attainment of this end depends greatly upon a due recognition of the remote causes, both mental and physical, — both moral and corporeal, — and of pre-existing and existing changes. The removal of the causes should always be preliminary to attempts to allay the excitement, whether nervous or vascular. When the former is associated with the latter, it should always be ascertained whether the nervous disorder is occasioned by increased vascular determination and action, or whether this latter results from the former. The nature of the exciting causes will often render the procession of morbid phenomena more or less manifest, and at the same time suggest the indications and means of cure. When the causes are of a mental or moral nature, when they have acted chiefly on the susceptibility and sensibility of the individual, and when they have produced suffering, pain, spasm, or irregular muscular actions, then those means which are classed as *sedatives*, or *anodynes*, or as *anæsthetics*, are usually required; but in many of such cases, *stimulants*, or *antispasmodics*, or even *tonics*, may also be necessary in conjunction with these, particularly when debility or exhaustion is present. If, however, the nervous excitement be attended by increased vascular action, or local determination, and more especially if this excitement be a consequence of the vascular disorder, those means which will allay this latter disorder should precede a recourse to those which act chiefly on the nervous system. In such cases, the *antiphlogistic* and other measures usually required, are often aided by a judicious recourse to sedatives or anodynes, or even to anæsthetics or narcotics, especially when want of sleep, or excessive pain, or restlessness, or disordered muscular actions, characterise the affection. If the nervous excitement or disordered actions be traced to vascular determination to, or inflammatory action in, any portion of the cerebro-spinal centres or their membranes, or to a similar affection of the sexual organs, or to other inflammatory or febrile conditions, then the same indications and means of cure as are noticed in the following section (§§ 52, 53.) are necessary; and when they have been judiciously employed, they may then be followed by such of the medicines belonging to the above classes, as are most appropriate to the existing states of nervous disorder.

53. vi. To allay or moderate increased vascular Action, or to remove vascular Disorder, is obviously required, especially when excessive; for we cannot with propriety leave this disorder to the unaided efforts of nature, unless it be slight, and the constitution and age of the patient be such as warrant confidence in the result. In order to allay increased vascular or febrile action, the physician should investigate its causes, its manifestations, the states of the secretions and excretions, the indications of vital power, and the conditions of the circulating fluids, as far as they are indicated by the pulse and by the hue of the surface, of the lips and tongue, and of the extremities. The diathesis of the malady — sthenic or asthenic, dynamic or adynamic — and other changes having been inferred from these sources, the *indications* and means of cure must be based upon them. If the vascular or febrile excitement be *sthenic* — if it be characterised by a salutary reaction indicating neither impairment of organic nervous or vital power, nor contamination of the fluids — it should be allayed by the means classed as *antiphlogistic* and *febrifuge*, comprising blood-letting when the nature of the case requires it, in any form. In addition to these, substances which promote the secretions and excretions, which equalize the circulation when it is inordinately determined to particular organs, and which derive it from the affected organ to the external surface, are generally beneficial.

54. When the vascular or febrile excitement is *asthenic*, — when vital power is exhausted or depressed, and the circulating fluids are contaminated or poisoned by infectious or injurious elements, or materials which irritate or excite the vascular system, — then the *indications* of cure are: — 1st. To support the vital energies; — 2nd. To promote the secreting and depurating functions; — 3rd. To correct or counteract the morbid states of the blood, by such medicines as may be absorbed into the circulation and produce these effects. The importance of this last indication is so great as to require for itself a distinct consideration (§§ 54—56.). Sufficient illustrations of this therapeutical principle are to be found in the Articles Erysipelas, Fevers, Inflammations, and Pestilences, as well as under other heads, where a more special consideration is devoted to the several topics embraced by it.

55. vii. Morbid States of the Blood are to be corrected or counteracted by Means which Observation, Science, and Experience have shown to be suitable to this End. — Morbid conditions of the blood are so various as respects their causes, associations, and consequences, and are so little known, especially as regards their intimate natures and the slighter and subtiler alterations, as frequently to render the *intentions* of cure imperfect, their accomplishment unsatisfactory, and the choice and operation of means doubtful. We know that the blood and the secretions and excretions are more or less contaminated in many maladies, and owing to many causes, — 1st. That the contamination may take place slowly and insidiously, until, upon the action of some exciting or concurring cause, active disease is developed in the form of gout or rheumatism, or of scurvy, or of cutaneous affections; — 2nd. That it may result more rapidly and much more dangerously, owing to the absorption of morbid secretions or injurious materials into the blood, as in cases of purulent or sanious infection; — and 3rd. That it may take place in a more rapid and specific manner, from a poisonous infection, producing its peculiar seminium, and propagating itself amongst all who are susceptible of its operation, even although in may cases the changes of the blood are neither considerable nor manifest. Morbid states of the blood are often the most evident and productive of the most dangerous results in the advanced stages of continued, remittent, exanthematous, and pestilential fevers; and these states, whether proceeding from foul, contaminating emanations, or other causes, or from a seminium of a specific nature, generating its like, affect both the secreted fluids and the solids, as shown when treating of the

maladies produced by these causes. In the earlier stages and slighter cases of these diseases the changes of the blood are either very slight or not very manifest; yet they nevertheless may be inferred to exist, inasmuch as the odour of the blood has been found different, and the same species of disease has been propagated by it.

56. Alterations of the blood are owing, as shown above and more fully in the Articles BLOOD and DISEASE, and in those on the maladies in which these alterations are the greatest, to pre-existing morbid states, as in *scurvy*, *purpura*, *gout*, *rheumatism*, &c., or to the poisonous operation of infectious miasms emanating from a person similarly affected, as in the *pestilences*, the *exanthemata* and *malignant fevers*. We know, that diseases which are most malignant and dangerous, proceed from causes which remarkably depress the powers of life, and either suppress or disorder the depurating functions. Hence it may be inferred that, although the specific cause produces effects which are constant and specific, the resulting changes on the blood, especially when heightened by vital depression and impaired excretion, increase the malignancy of the malady, and often either occasion or hasten death. Now, to counteract these changes it becomes necessary —1st. To support, promote, or restore vital power, as far as may be possible; 2nd. To promote or restore the several excreting or depurating functions;—and 3rd. To endeavour to correct or neutralize the morbid materials or elements formed or accumulated in the blood in the progress of, or antecedent to the full development of the malady.—The *first* and the *second* of these intentions should be energetically carried out by the same or similiar means to those adverted to above (§§ 37—47.)—by powerful *restoratives*, *tonics*, *stimulants*, &c.; and by stomachic, warm, and stimulating *emetics*, *diaphoretics*, *diuretics*, and *purgatives*, as may be most appropriate to the nature and state of the malady.

57. The *third indication* is that which more especially concerns the present subject. In certain diseases, in which the blood is very manifestly altered, the crasis or coagulating power of this fluid is increased, as in rheumatism and gout; whilst in others it is more or less impaired, as in scurvy, and in the malignant maladies alluded to above. In the former, *alteratives*, as the alkalies and the alkaline earths, especially magnesia, are required to neutralize the acids formed in the digestive canal, and even also in the blood; in the latter, the most powerful *stimulants*, *tonics*, and *antiseptics*, are necessary to the restoration of vital power, of the irritability of the contractile fibre, and of the crasis of the blood, and to the counteraction of the tendency to dissolution manifested by both fluids and solids — to the putridity contended for by the older writers. Of the several tonics and stimulants often required to fulfil the present indication, it is unnecessary to make mention at this place, as their use is fully shown under the diseases in which they are most appropriate. Of those which manifestly prevent or counteract a septic tendency, it may be remarked that, whatever supports or restores vital tone, has indirectly this tendency, but that there are substances which possess this property in a more direct manner—that are more strictly *anti-septic*, as hydrochloric acid, the chlorides and hydrochlorides, chlorinated waters or fluids, the chlorate of potash, the nitrate of potash and several other alkaline salts, the terebinthinates, balsams and camphor, creasote and tar, the cinchona and cascarilla barks, and the barks of several trees, as the oak-bark, willow-bark, cedar-bark, &c. In the more urgent or malignant cases, two or several of these may be conjoined or given with stimulants or tonics, as the decoctions or infusions of cinchona, or of serpentaria, or of arnica, with nitrate of potash, the carbonates of the alkalies, or the chlorate of potash, &c.

58. viii. TO ALLAY MORBID IRRITATION BY MEANS SUITED TO THE SEVERAL MANIFESTATIONS OF THIS CONDITION is often of urgent importance, and always is attended by great difficulty, inasmuch as the successful accomplishment of this object requires an accurate interpretation of the cause and essence of the morbid conditions or changes on which the irritation depends. The source of irritation may exist *locally* in any structure or tissue, or in a nervous ramification; or generally, in the blood and in the secreted and excreted fluids; or both *locally* and *generally*. When it is *local*, it may, according as it may affect the nerves or the blood-vessels at its source, either occasion spasm, convulsion, or severe or neuralgic pain, or produce alterations of structure, acute or chronic inflammation, and their several consequences. When it is *general*, febrile action, more or less violent or acute — more or less rapid in its course, and dangerous in its issue — is always present; the morbid, contaminating, or poisonous materials present in the blood, and other fluids inordinately exciting vascular action, and at the same time depressing nervous or vital power. When the irritation commences locally and becomes general, then the secretions and nutrition of the part have been changed, and the morbid products have been absorbed into the circulation; and whilst the local irritation continues, the general irritation is superadded, occasioning an amount of febrile or general disturbance, varying with the nature and the amount of the materials absorbed, with the state of predisposition or diathesis, with the accumulation of these morbid matters in the blood, or with the rapidity of their elimination by the emunctories. Thus we have presented to our observation sources of local irritation and change, followed more or less rapidly by every grade of hectic or irritative fever; and not merely by these, but also by destructive changes consecutively produced in various organs, and more especially in those concerned in the elimination of the morbid matters from the blood. It is unnecessary to prosecute this subject any further, as it is fully considered in the Articles ABSCESS, ABSORPTION, HECTIC FEVER, and more fully and in its several relations, both pathologically and therapeutically in the article IRRITATION.

59. ix. TO ALTER, OR MORE COMPLETELY TO CHANGE MORBID STATES OF INDIVIDUAL TISSUES, OR OF THE STRUCTURES GENERALLY, may be considered an intention, the fulfilment of which is beyond our powers. I have shown, when treating of typhoid, adynamic, putro-adynamic, and malignant *fevers*, and *exanthematous* and *pestilential maladies*, and of *scurvy*, *syphilis*, &c., that we have every proof of alterations having taken place, in the advanced course of these dis-

eases, not only in the fluids, but also in the vital cohesion and intimate organisation of the more solid structures, and yet the vital powers may arrest these alterations, and gradually restore the healthy conditions. This great end can be attained only by the restorative efforts of nature — by the development of vital resistance to further changes. The constitutional powers often, by resisting further alterations, accomplish this object without assistance, or merely by the aid of freer ventilation, of a purer air, or by the removal of injurious influences. But these powers are often assisted or developed by art — by means which restore or promote nervous or vital energy (§§ 37, *et seq.*), and which moderate, correct, or remove morbid states of vascular action and alterations of the blood (52—56.). The indications, as well as the means, are fully discussed in the treatment of the maladies just referred to, and of several chronic and cachectic diseases, especially *scrofula*, *rickets*, *scurvy*, *venereal diseases*, &c., to which I must refer the reader.

60. x. To prevent or remove Exhaustion in its various Forms is often required of the physician; but the nature of the previous excitement of which exhaustion is the consequence, should be ascertained, as the issue in many cases depends upon such excitement and its causes — whether mental or physical, moral or corporeal. The *indications* and the *agents* required to fulfil them, are usually the same as have been already mentioned when treating of primary depression of nervous or vital power (§ 37.). In this latter state of vital depression, although its cause may be more energetic and dangerous, yet the frame is more generally free from structural change of its tissues or organs, and reaction is more readily produced, than in the secondary vital depression, or exhaustion consequent upon mental, nervous, or vascular excitement. Whereas in the exhaustion thus produced, and more especially when following vascular disorder, alterations of the fluids, and even of the structures, are more likely to be present, and to complicate the vital depression, the structural change and the vital condition mutually increasing each other, often opposing the influence of the most judicious means of cure, and generally requiring the most energetic and the best-directed agents for their removal. The observations which I have offered on this subject when treating of *consecutive and complicated* Debility (see Art. Debility (§§ 43, *et seq.*) will further elucidate this subject.

61. xi. To Remove Congestions of Blood, according to their Seats, is one of the most important ends for which medical aid is required: to accomplish this end the most energetic agents are often necessary, especially when congestion is complicated with marked depression of organic nervous or vital power, or with oppression or suppression of the functions of the congested organ. In these circumstances the indications are:— 1st. To *derive* the circulation from the seat of congestion to other external parts, by suitable *revulsants*, *rubefacients*, &c.; — 2nd. To equalize the distribution of blood throughout the frame, as advised above (§ 48.); — 3rd. To support nervous or vital power, especially when inordinately depressed, by appropriate restoratives and stimulants; — and 4th. To restore the function of the congested organ. This subject is fully elucidated in the Articles Congestion and Blood (§§ 23—33.).

62. xii. To enable organic nervous or vital Power to resist the slow Extension of Disease, or to overcome its more rapid Advances, and to throw off parasitical and other Formations, are ends which should be much more frequently proposed for successful attainment in practice, than they usually are. In many diseases, the efforts of nature are insufficient for these purposes, unless they be aided by suitable means. In malignant and pestilential maladies, these efforts are inadequate in the most severe cases, and should be reinforced by the most energetic means, especially by tonics, stimulants, antiseptics, and others already noticed. In diseases of a slower course, as scrofula, scurvy, and morbid formations of various kinds, tonics, conjoined with alteratives, are generally indicated; but very much depends upon the choice which is made of these means, which should be appropriate to the nature of individual cases. In most of the diseases which require the development of vital resistance, restorative agents ought to be directed both to the organic nervous system, and to the blood — the energy of the former must be excited, and the crasis and purity of the latter must be preserved, or restored when deficient. In acute malignant maladies, the means which we possess are not always equal to the attainment of these ends. The vital energy may be too far depressed to be excited by medical agents, however well selected or directed; or, if it be excited, the reaction evinces features equally morbid and dangerous with those of the previous depression; for the states of the fluids, especially of the blood, conduce to structural changes as rapidly and certainly during vascular reaction as during vital depression. Hence it is generally insufficient merely to rouse the organic, nervous, or vital power, unless we also procure a free elimination of morbid materials or elements from the blood by the emunctories, and, at the same time, prevent or correct alterations of this fluid by means appropriate to the inferred alteration, as advised above (§§ 54—56.).

63. In chronic, malignant, or structural maladies, the constitutional or vital power is impaired, and the blood is altered more or less, although not always visibly or demonstratively altered. As these maladies advance, especially cancer, tubercle, rickets, &c., the alteration of the blood becomes more and more evident, this fluid being thinner, poorer, or deficient in red globules. Hence the necessity of supporting the powers of life by means which will neither excite nor irritate them, and of preserving the healthy state of the blood by conjoining with those means such as will correct or prevent alterations of this fluid, and will, at the same time, promote the conversion of the colourless or chylous globules of the blood into red globules — will promote the processes of sanguification and nutrition — as chalybeates and cod-liver oil.

64. The same indications and means which are most successful in resisting the slow extension of organic or malignant maladies, are also most advantageously employed in throwing off *parasitical animals* and *productions*, and in preventing their generation or formation. Although the expulsion of parasitical animals from the diges-

tive canal requires a recourse to a class of remedies which act chiefly either on the canal itself, or on the *entozoa*, or on both, and are usually classed as *anthelmintics*; yet the reproduction of these animals is to be prevented only by means which develope organic nervous power, which improve the states of the blood, and of the secretions and excretions, which promote the digestive functions, and which insure a healthy nutrition. Of these means nutritious food, and pure air and pure water, are amongst the most important.

65. xiii. To RESTORE, AS FAR AS MAY BE RESTORED, IMPAIRED OR LOST FUNCTION is to remove a very large proportion of the ailments to which our frames are liable. This being a great end of medical treatment, the course which may be pursued in attaining it should be duly considered, and with a strict reference in practice to the nature of individual cases. The means used for attaining this object should be directed either — 1st. to the sources of function, — 2nd. or to the organ itself, whose function is impaired or lost, — 3rd. or to the promotion of the general health and constitutional powers, — and 4th. or even to these conjointly, coetaneously, or consecutively. — The great importance of attaining this object has been insisted upon, when noticing the consequences of impairment of the excreting, or depurating functions (§ 41, *et seq.*); but there are other functions than those of elimination which may be impaired, and the issue may be more or less serious. Most of the disorders comprised under the *first class* in the arrangement which I have followed in this work, consist of impaired function or defective action. And in all these the indications now stated may be severally adopted.

66. The means of cure, when not acting directly on the the surface or organ to which they are applied, and frequently even when directly effecting such surface or organ, act also — 1st. on the nervous systems, especially the organic, — 2nd. on the vascular system and on the blood; and through either or both these channels, indirectly or consecutively on the organs or surfaces whose functions are defective. The deficient function may thus be restored by stimulating the nervous endowment of its appropriate organ at or near the origins of the nerves; or by exhibiting medicines which are imbibed or absorbed into the circulation, and either alter the constitution of the blood or excite the organ or surface whose functions are impaired by their presence in this fluid. The actions of the kidneys, for instance, may be increased by stimulating applications over the loins, or by various substances (*diuretics*), which having passed into the circulation, and being carried by the blood to these organs, excite them to increased action, either whilst these substances are being eliminated by them, or whilst circulating through them before they are eliminated by some other emunctory. The secreting and excreting functions of the liver, of the digestive mucous surface, of the bronchial mucous surface, of the skin, &c., are augmented in similar ways, by the several classes of medicines, which, owing to these respective predominant modes of action, according to their doses and combinations, have been called *chologogues*, *aperients* or *purgatives*, *expectorants*, *diaphoretics*, &c.

67. xiv. To PALLIATE URGENT OR DISTRESSING SYMPTOMS, EITHER WHEN THEY CANNOT BE REMOVED, OR IN ORDER TO OBTAIN TIME TO ASCERTAIN THEIR SOURCES and FOR THE REMOVAL OF THESE SOURCES, OR PATHOLOGICAL CAUSES, is an intention which the physician may propose to himself either at the outset or invasion of disease, or at its ultimate or fatal close — even in cases of little or no danger, and in those of the greatest danger. It is obvious that the means, in these very different circumstances, should have strict reference to the nature and tendency of the phenomenon or symptom by which the patient is distressed. If it be alarming sinking, stimulants and restoratives are required; if violent or painful spasm, antispasmodics, anodynes, sedatives, &c. according to the seat, antecedents and concomitants of the *spasm*; if it be extreme pain, sedatives, narcotics and other means advised under the head of *neuralgic affections*; if to remove alarm or mental perturbation, the combination of restoratives or stimulants with sedatives or narcotics; making always such selection of means as experience, derived from enlightened and close observation, will suggest and will point out as appropriate to the features and complications of particular cases. A judicious application and combination of means, in the most extreme cases, and when no hopes of prolonging life can be entertained, will, in conjunction with the solace of religion, render dissolution as calm and peaceful as the accession of the natural sleep.

68. xv. To EXCITE AND DIRECT THE MENTAL EMOTIONS, SO AS TO PREVENT THE EXTENSION OR AGGRAVATION OF DISEASE AND TO INSURE OR HASTEN RECOVERY, is one of the highest aims of medical science; and is often conducive both to the prevention and to the removal of disease. *Fear*, *anxiety*, and all the *depressing emotions* not only predispose the frame to the invasion of disease, but alas impart to disease an asthenic or low character, and conduce to unfavourable results; whereas, *confidence*, *hope*, and all the elevating emotions support the powers of life, reinforce the vital resistance, and impart a great share of the efficacy exerted by the means of cure. Not only ought all mental and moral circumstances which either have caused, or have influenced, the progress of disease, to be removed as far as possible, but the mind of the patient should be inspired with hopeful sentiments, and by the confident bearing and expression of the physician. There are numerous circumstances also directly affecting the mind, and indirectly influencing it through the media of the senses, which aid the treatment of disease, especially of diseases which are chronic, or which impair the mental energies. The chief of these are: agreable mental occupations; the solaces resulting from the performance of duties and from conferring benefits on the deserving; the contemplation of the numerous wonders and beauties of nature; the enjoyment of musical and harmonious sounds, of the appeals of reason and eloquence, and of instructive and interesting society; the affectionate regards of relations and friends, and rational amusements and relaxation. In addition to these, changes of scene, of air and locality, or more complete change of climate, and travelling, with all the circumstances which render travelling mentally and bodily healthful, should not be overlooked.

69. Having thus endeavoured to point out, for the *instruction* of the inexperienced, and as *suggestions* to others who wish to review the stores of information

with which observation may have enriched their minds, what I consider to be — 1st, *The fundamental principles of medical practice or Therapeutics*, — 2nd. *The more general principles*, — and 3rd. *The special principles of Therapeutics*, I shall conclude with an Arrangement *of the modes of employing*, and *of the operation of medicines*. When treating of Poisons, I gave a full exposition of the modes of exhibiting, the channels of operation, and the physiological and pathological effects of poisons. It is obvious that, as many poisons are employed, although in very different states and doses, as very important means of cure, the *classification* of these will necessarily approach to that of *Therapeutical Agents*; and hence several resemblances will be observed between the arrangement given in that article and the classification which I am now about to submit to my readers.

Therapeutical Agents, Classification of, according to their Modes of Action and Effects.

The classification of medical agents is a matter of great difficulty, and hence numerous excellent attempts have been made to overcome the difficulty by many of the more recent writers on Therapeutics. My limits will not admit of my noticing these in the manner which they deserve; but the reader who is desirous of becoming acquainted with them, will find them in the works of their respective authors enumerated in the Bibliography. The arrangement I am now about to adopt, may not be superior to several of those which have been already published; but, as it is in accordance with the views exhibited in this work, more especially in this article, and in that on Poisons, I have adduced it at this place.

I. Psychical or Mental Remedial Influences.
i. Those furnished through the Media of the Senses. — *The sensual affections of mind* — *External affections of mind.*
  A. Affections of mind induced by *pleasant odours* and *tastes*.
  B. States of mind induced by *vision* — by the sight of the beautiful in nature and art, of endeared objects, especially after absence or dangers, &c.
  C. *Sounds* and *Noises*, of various kinds, especialy such as are monotonous, often favour the occurrence of sleep. — Appeals of reason and eloquence. — Musical and harmonious sounds, vocal and instrumental, in due variety or combination. — The society of relations and friends. — Rational amusements, &c.
  D. The Sense of *Touch*: — Frictions — Rubbing — Shampooing — Flagellation, &c.
ii. The Intellectual affections of mind.
  A. A due and moderate exercise of the powers of *perception* — *conception* — *memory* — or *powers of consciousness*.
  B. A well directed exertion of *imagination* — — of *reason* and *judgment* — and of *other active intellectual states*.
  C. A due exercise of the *powers* of *reflection* — of *right* and *wrong* — of *causation and truth* of *duty* — *immortality*, &c. — of *rational incentives to duty*.
iii. The Moral Affections of Mind.
  A. *Instinctive or simple moral affections.* — Hope — Confidence — Anticipation of pleasures and happiness — Love — Desire of approbation, of knowledge, of power, &c.
  B. *Rational emotions of mind.* — The duties which the individual owes himself and those connected with him. — Religious obligations — Agreeable mental pursuits — Useful occupations — Rational amusements &c.
II. Hygeienic Agents and Influences.
i. Food and Drink.
  A. *Food.* *a.* Vegetable and farinaceous aliments. *b.* Animal food. *c.* Mixed food. *d.* Regulated diet or dietetic regimen during and after disease.
  B. *Drinks.* *a.* Distilled and spring waters. *b.* Mineral waters. *c.* Beverages, wines and liquors. *d.* Prescribed forms or combinations of these.
  C. *Condiments* — Spices, Sauces, &c.
ii. Air and Locality.
  A. *Purity of air*, in connection with locality with the soil and with its productions.
  B. *Light and sunshine.*
    a. Influence of light.
    b. Effect of the sun's rays — the chemical — the electrical or magnetic — the colouring, &c.
    c. Of the absence of either or all these.
  C. *The Temperature, dryness, or humidity of the air.* — Dependence of these on latitutide, on altitude, on the soil, on the productions of the soil, on position or locality.
iii. Of Exercise.
  A. *In-door exercise.* *a.* Occupations and employments.
  B. *Exercise in the open air.* *a.* Walking. *b.* Riding. *c.* Active and athletic exercises.
iv. Climate and Change of Climate. — (see Art. Climate.)
  A. *Climate of Great Britain and Ireland.*
  B. *Foreign climate.* *a.* European. *b.* Asiatic. *c.* African. *d.* American. *e.* Australasian and Polynesian.
  C. *Changes of climates.*
    a. Effects of change on different races or colours.
    b. Effects of change on disease.
  D. *Travelling and Voyaging.*
    a. Travelling by Railroads, or otherwise.
    b. In sailing or in steam-vessels.
    c. The several effects of these modes.
III. Medicinal Agents — Medicines applied to the Frame.
i. Modes in which Medicines are employed or exhibited.
  A. *To the respiratory organs.* — Inhaled or inspired.
  B. *Taken into the stomach.* — In various forms and combinations, without or with the food.
  C. *Injected or introduced into the bowels.* — Enemata and suppositories.
  D. *Introduced or injected into the sexual and urinary organs.*
    a. Into the vagina.
    b. Into the urethra and urinary bladder, &c.
  E. *Applied externally.*
    a. To the general surface, or part of the surface.
    b. To a part of the surface after the removal of the cuticle. — Endermic medication.
  F. *Injected into the blood vessels.*

ii. The Action of Medicines.

- *A. Locally and Primarily* — On the tissues to which they are applied.
- *B. Remotely and Consecutively.* — Sympathetically, and by the blood.
- *C. Both Locally and Remotely.*
- *D. Chemically*—By altering the chemical constitution of fluids and solids.
- *E. Mechanically and Surgically.*
- *F. Vitally* — By altering the states of function or vital manifestation.
- *G. Organically.* — By affecting the structure or the intimate organization of parts.

ii. The Modes in which, and the Channels through which Medicines act.

- *A. Primarily and Locally.*
  - *a.* On the nerves of the part.
  - *b.* On the capillaries of the part, and on the contained fluids.
  - *c.* On the irritability of the tissues.
  - *d.* On the organization and structures of the part.
- *B. Sympathetically or through the media of the of the organic and the animal systems of nerves.*
- *C. By imbibition, or endesmose and absorption.* Through the medium of the circulating fluids, especially the blood.

iv. The General Effects of Medicines.

- *A. Depressing nervous influence and vascular action.*—Lowering vital power—Sedatives or depressants.
- *B. Stimulating nervous influence, either organic or animal.*—Stimulants.
- *C. Exciting vascular action.*—Phlogistics.
- *D. Exciting both nervous influence and vascular* action—Excitants.
- *E. Exhausting nervous influence, or vital energy* — Exhaurients.
- *F. Altering, otherwise than dynamically, nervous influence and vital power.*—Alterants.
- *G. Changing the sensible appearances and the constitution of the blood.*—Hæmapharmaca. Blood-Remedies,
- *H. Producing a succession of two or more of these effects,*

Classification of Medicines according to their Special Operation.—The Physiological Action of Medicines.—*Remedial agents according to their special effects.*

Class I. Abstracting the Animal Heat, or depressing the Calorific Process in a part or throughout the Body. — Refrigerants.

i. *External Refrigerants:* — Thin clothing—Cool or cold air—Cold Baths—Cold affusions or Douche—Cold sponging—Shower-baths—Cold or evaporating lotions—Ice applied externally —Cold solutions,

ii. *Internal Refrigerants.*

- *a. Dietetic Refrigerants.*—Lemons, Oranges, Mulberries, Strawberries, Pomegranates, Confected Ices, Tamarinds, Common Sorrel, Lettuce, Whey, Butter-milk, &c.
- *b. Medicinal Refrigerants.*—Cold fluids,—Ice and Iced waters—Solutions of hydrochlorate of ammonia—of Nitrate of potash —of Nitrate of soda—of most of the alkaline neutral salts—Citric Acid and the citrates—Tartaric acid and the tartrates—Acetic acid—Acetate of ammonia, &c.

Class II. Depressing, suppressing, or benumbing Sensibility, or paralysing, Involuntary and Voluntary Motions. — Sedatives.

i. *Mental Sedatives,* — Grief, Anxiety, Fear, Terror, Regret, Sadness, Disappointment, Loss of fortune, reputation, friends &c., Home-sickness, &c.

ii. *Physical or Medicinal Sedatives.* — Humid states of the atmosphere, and whatever favours the transfer or eduction of electricity from the frame. The preceding agents (Class 1.) when long or largely employed, relatively to the state of vital power or resistance, The preparations of Lead and Saturnine Solutions, Hodrocyanic acid, Laurel water, Volatile oil of bitter almonds, Cyanide of potassium; Tobacco and its several preparations, especially the oil; the infusion, decoction, and smoke of Tobacco, Nicotina, Sulphuretted Hydrogen gas, Carburetted hydrogen gas, Carbonic acid gas, Chloroform and Æthers, especially when inhaled; excessive blood-letting, or vascular depletion causing syncope.

Class III. Softening, liquifying, or dissolving one or more of the Tissues or Textures.—Dissolvants.

The Alkalies and alkaline subcarbonates—Antimonial salts—The Oxalates and Oxalic acid—Boracic acid—Biborate of soda—Putrid animal matters, &c.

Class IV. Astringing the tissues, and increasing the Tone or Vital Cohesion of Structures — Astringents and Tonics. — Antiseptics.

i. *Vegetable Astringents.* — Oak-bark, Nutgalls, Catechu, Kino, Uva-Ursi, Rhatany, — Tormentilla, Pomegranate bark or rind, Logwood, Bistort, Matico.

ii. *Bitter Tonics.* — Quassia, Simarouba, Gentian, Calumba, Cheirayta, Common Centaury, Buckbean, &c.

iii. *Astringent and Bitter Tonics.*—The Cinchona Barks, Spigelia,, Elm-bark, Willow-bark.

iv. *Aromatic Tonics.* — Cascarilla bark, Wormwood, Elecampane, Canella bark, Angustura bark, Hops, Cedar bark.

v. *Acid Tonics. a. Mineral Acids:*—Sulphuric, Nitric, and Hydrochloric acids; Alum. *b. Vegetable Acids.* — Formic acid, Gallic acid, Catechuic acid.

vi. *Alkaloid Tonics.* — Quina, Cinchonia, Salicine, Quassine.

vii. *Metallic Tonics.*—The salts, oxides, and carbonates of iron, of silver, of zinc. The bichloride of mercury in minute doses.

Class V. Irritating Tissues, Structures, and Organs. — Irritants. — Corrodants.

i. *The mineral salts,* in large doses or in quantities above those producing a tonic or astringent action. The chlorides and chlorates of the alkalies. The metallic salts as the sulphates and chlorides of zinc, copper, &c. The Nitrate of Silver, salts of antimony, &c. Lime unslacked.

ii. Euphorbia, Croton Tiglium, Savine, Rhus Toxicodendron, Mezereon, Pyrethrum, and numerous acrid or irritant *vegetable productions* and vegetable oils. (See Art. *Poisons,* §§ 234. —248.)

iii. *Animal Irritants,* as Phosphorus, Cantharides, and the scales of many insects. Morbid Animal secretions and poisons.

iv. *Physical and Mechanical Irritants:* — Urtication, Heated air, Hot water, Heated metal. The Actual Cautery, Setons, Issues, &c.

Class VI. Relaxing the Tissues, or lowering the Irritability of Structures. — Emollients, — Demulcents.

i. *Aqueous Emollients:*—Water at ranges of temperature betweeen 65° and 170°. —Aqueous Vapour, Medicated Aqueous Vapours.

ii. *Mucilaginous Emollients—Demulcents:*—Prepared from gum Arabic, Tragacanth, Mallows, Marsh-mallows, Coltsfoot, Linseed, Sweet Almonds, &c.

iii. *Amylaceous Emollients:* — Farinaceous and starchy substances. Flour, Oatmeal, Barley, Sago, Arrow-root, Starch, Tapioca, &c.

iv. *Sacharine Emollients:* — Honey, Liquorice, Sugar of Milk, Beet-root.

v. *Albuminous Emollients:* — White and yolk of eggs, Milk, Saliva.

vi. *Gelatinous Emollients:* — Gelatine in its pure or other forms, or as obtained from Isinglass, Hartshorn shavings, Tendons, Bones.

vii. *Oleaginous Emollients:*—Animal fats, Butter, Spermaceti, Vegetable oils, especially Palm, Olive, Almond, Linseed, and other oils.

Class VII. Stimulating, or exciting the Vital Manifestation of a Tissue or Organ. —Stimulants—Excitants.

Stimulants are related, on the one hand, with *Tonics* and *Irritants*, especially when the latter are given in small doses; and with *Sudorifics*, *Evacuants*, and *Diureties*, on the other. They act primarily on the organic nervous, and on the Cerebro-spinal nervous Systems, according to the manner of using them.

i. *Condimental and Aromatic Stimulants.*—Garlic, Leeks, Onions, Mustard, Horse-radish, Scurvy-grass, Water-cresses, and other anti-scorbutic plants. The hot or warm Spices:—Ginger, Pepper, Capsicum, Cloves, Cinnamon, Canella, Ginseng, &c.

ii. *Resinous and Balsamic Stimulants:* — Guaiacum, Mastic, Elemi, the Turpentines, Copaiva, Opobalsum, Benzoin, Styrax, Tolu, Peruvian Balsam.

iii. *Gum-Resins:* — Assafœtida, Ammoniacum, Galbanum, Sagapenum, Opoponax, Myrrh, Olibanum.

iv. *Camphoraceous Stimulants:* — Camphor, Arnica, Serpentary, Contrajerva, Valerian, Cajuputi oil.

v. *Ammoniacal and other Stimulants:* — The preparations and Salts of Ammonia. The empyreumatic oils, Phosphorus, Musk, Sumbul, Castor.

vi. *Alcoholic Stimulants:* — The several alcoholic liquors. Wine, Alcohol, the Æthers. Malt and fermented liquors.

vii. *Calorific and Electrical Stimulants.* — A temperature exceeding 60°. The sun's rays, especially as imparting light, heat, and electrical influence. Dry heat above 60° and not exceeding 120°. The electro-motive or the electro-magnetic current.

Class VIII. Augmenting the Secretions and Excretions—Evacuants—Depurants.

Substances which produce this effect, generally first excite the organic nerves, supplying the parts on which they act, and consecutively attain the end which chiefly characterizes them. In larger doses, they not only stimulate the functions to which they are directed, but often also *irritate* more or less remarkably the tissues to which they are applied. They are thus closely related to *stimulants*, and to *Irritants* and *Alterants.*

i. *Increasing the Secretions from the Schneiderian membrane.* — *Errhines.*

- a. *Aromatic Errhines:* Lavender, Marjoram, Sage, Spices, &c. reduced to powder.
- b. *Acro-Sedative Errhine:* — Tobacco, Euphorbium, Veratrum, Asarum, &c.

ii. *Augmenting the salivary Secretion—Sialagogues.*

- a. *Local sialogogues — Masticatories:* — Mezereon, Pellitory of Spain, Horse-radish, Ginger, Betel nuts, Betel leaf, Mustard, Tobacco, &c.
- b. *Remote or contingent Sialogogues:*—Acting through the medium of the circulation:—preparations of Mercury, of Iodine, of Gold. Foxglove, Hydrocyanic acid, Nitric acid, &c., in rare instances.

iii. *Provoking the discharge of the contents of the Stomach, and increasing the secretions from its villous surface.* — *Emetics.* — *Vomits.* — The biliary and pancreatic secretions are also frequently increased by the operation of emetics.

- a. *Vegetable Emetics:* — Ipecacuanha, Tobacco, Mustard, and other vegetable irritants, taken in large doses.
- b. *Mineral Emetics:* — Emetic Tartar, Sulphate of Zinc, Sulphate of Copper.

Of these Tobacco and Emetic Tartar are the most depressing: often so depressing as to be injurious or even poisonous. They ought never to be given in states of vital exhaustion or Narcotism.

iv. *Producing Alvine evacuations.*—*Purgatives* — *Cathartics:*—

- a. *Laxatives or Lenitives, Mild Aperients:*—Manna, Cassia pulp, Tamarinds, Prunes, Almond and Olive Oils, Magnesia, Bitartrate of Potash.
- b. *Cooling Antiphlogistic or Saline Purgatives:*—The Sulphate of Soda, Potash and Magnesia, Citrate of Magnesia, Tartrate of Potash.
- c. *The Milder Purgatives:* — Sulphur, Senna, Rhubarb, Aloes, Castor Oil.
- d. *Chologogue Purgatives. Alterative or Mercurial Purgatives:* — Calomel and other preparations of Mercury. Bitartrate of Potash in large doses.
- e. *Drastic or Acrid Purgatives. Hydragogue Cathartics:* — Jalap, Scammony, Gamboge, Black Hellebore, Colocynth, Sulphate of Potash, Elaterium, Croton oil.

v. *Promoting the Excretion of Urine — Diuretics:* — Acting chiefly through the medium of the Blood.

- a. *Acid and Saline Diuretics:* — The dilute Mineral and Vegetable Acids, the Carbonates of the Alkalies, the Vegetable Salts of the Alkalies, especially the Bitartrate and the Acetate of Potash, the Citrates of Soda, Potash, and Magnesia, the Nitrates of Potash and Soda.
- b. *Irritant Diuretics:* — Squills, Common

Broom, Cantharides, Juniper, Turpentines, and Balsams.

c. *Sedative or Depressing Diuretics:* — Digitalis, Colchium, Tobacco.

d. *Alcoholic and Ætherial or Stimulant Diuretics:* — Dilute Spirit, Gin, Ale, the Nitric and other Æthers.

vi. *Promoting Cutaneous Transpiration.* — *Diaphoretics.*

a. *Diluent or aqueous Diaphoretics:* — Warm Fluids, Whey, Tea, Gruel, Broths, &c.

b. *Saline, Antimonial or Cooling Diaphoretics:* — Acetate, Citrate, and Carbonate of Ammonia; Alkaline Citrates, andTartrates, Nitrate of Potash, Sulphur, Sal Ammoniac, the preparations of Antimony, weak solutions of Camphor.

c. *Opiate Diaphoretics:* — Opium, Morphia, and their preparations, conjoined chiefly with Ipecacuanha, or with one or more of the foregoing, or with the Æthers.

d. *Warm or stimulating Diaphoretics:* —The preparations of Ammonia, Sassafras, Mezereon, Guiacum, Camphor in full doses, Spirits or Alcoholic fluids, the Ætherial preparations, Coffee.

vii. *Promoting the discharge from the Bronchi and Trachea.—Expectorants.*

a. *Vapours inhaled into the Lungs;*—The dilute vapour of Turpentine, or of Tar, or of Creasote, or of Camphor, or of Iodine, or of Benzoic or Acetic Acid; the smoke of Stramonium, or of Tobacco.

b. *Stimulating Expectorants; acting chiefly by the Organic nervous system and the Blood:* — Camphor. The Gums and Gum-resins, the Balsams, Ammoniacum, Squills, Senega, Garlic, Onions, Sulphur.

c. *Nauseating or emetic Expectorants—Depressing Expectorants:* — Preparations of Antimony, of Ipecacuanha, Lobelia inflata, Tobacco.

viii. *Exciting the Catamenial Discharge—Emmenagogues.*

a. *Purgative Emmenagogues:*— Acting chiefly on the lower Bowels. Aloes, Camboge, Colocynth, Calomel, Black Hellebore.

b. *Diuretic and stimulating Emmenagogues:* — Savine, Juniper, Rue, Cantharides, the fœtid Gums, Castor, the preparations of Iron, Myrrh, &c.

d. *Acting more directly on the Uterus:* — More frequently restraining hæmorrhage from the uterus by exciting contractions of its parietes, than favouring a discharge from it. Ergot of Rye, Biborate of Soda, Oil of Turpentine.

Class IX. Exciting the Cerebro Spinal Nervous System — Nervous and Muscular Excitants.

Nux Vomica and Strychnia, and plants containing Strychnia, Brucia Antidysenterica, Coculus Indicus, Coriaria Myrtifolia, &c. &c.

Class X. Irritating and depressing Medicines—Irritating and paralysing.—Acro-Sedatives. Substances which irritate the Tissues and depress organic nervous or vital power.

i. *Mineral Acro-Sedatives:*—Arsenic and its compounds. Tartar Emetic and Antimonial preparations. Cupreous substances: Baryta and its Salts; Sulphate of Potash in large doses, Oxalate of Potash, Chromate of Potash, the Sulphurets, Tartaric Acid.

ii. *Vegetable Acro-Sedatives:* — Aconite and its preparations. Colchium autumnale, Helibore and its species, Digitalis, Indian and Virginian Tobacco, Castor Seeds, Jatropha Manihot, Veratria, &c.

Class XI. Irritating and Alterative—Acro-Alterant Medicines.

i. *Mineral Acro-Alterants:* — Chlorine and the the Chlorides. Chlorate of Potash, the Hypochlorides: Iodine and its compounds, Iodide of Iron, of Mercury, of Arsenic, Bromine, Mercury and its preparations, Arsenic, &c. The Alkalies.

ii. *Vegetable Acro-Alterants:*—Iodine, Bromine, the Thorn-apple, Conium, Belladonna, Benzoin, Camphor, Turpentine and the Terebinthinates and Balsams, Tar, and Tar Water.

Class XII. Altering Vital Actions.—Alterants—Deobstruents:—Changing the state of the secretions, and of the nutrition of certain textures and organs, according to the substance employed, and the mode of employment.

i. *Mineral and Metallic Alterants.*—Sulphur, Magnesia, the Carbonates of the alkalies, the Preparations of Iron, of Mercury, of Iodine, of Arsenic, &c.

ii. *Vegetable Alterants:*—Taraxacum, Carbon, Sarzaparilla, Sassafras, Citric acid and Citrates; the preparations of Iodine, especially the Iodides,

iii. *Animal Alterants:*—Cod and Torsk liver oil, Ox-gall.

Class.—XIII. Stupefying or narcotising the Nervous Systems.—Narcotics.—Hypnotics.—Anæsthetics.

i. *Gases and Vapours, especially when inhaled:*—Carbonic acid gas, Carburetted hydrogen gas, Sulphuretted hydrogen. The vapour of Chloroform, or of the Æthers, or of Alcohol.

ii. *Vegetable Narcotics:*—Opium, Morphia, and their preparations. The smoke of Opium, Henbane, Cicuta virosa, Poppy, Hops, Hemlock-dropwort, Lollium temulentum, Canabis Indica (an uncertain narcotic).

Class XIV. Affecting the States of the Blood and Capillary Blood-vessels Hæmato-cathartica.—Hæmapharmaca.

i. *Altering the Appearance and Condition of the Blood. Blood-medicines:*—The Alkaline Carbonates, Magnesia and its citrate, the Nitrate, Citrate, and Chloride of Potash; the Chlorate of Potash; the Nitrate, Citrate, and Chloride of Soda; Chloride of Sodium; Alkaline Solutions, Sulphur, weak or dilute Acids, Chlorine and Chlorinated solutions and waters, Nitro-hydrochloric acids, Citric acid. The preparations of Iron; Chalybeate and Mineral springs and artificial mineral waters.

ii. *Constringing the Capillary blood-vessels and altering the state of the blood circulating in them:*—The Mineral acids, the diacetate of lead, the spirits of Turpentine, the Ergot of Rye, the Gallic and Tannic Acids, Matico, Creasote.

Class XV.—Inducing Contractions of the Uterus.—Parturifacients.—Parturients. Ergot of Rye, Biborate of Soda, Spirits of Turpentine, in full doses or in enemata.

Class XVI. Expelling Worms and Preventing the Formation of Worms.—Anthelmintics.

i. *Mechanical Anthelmintics*:—Filings of Iron, Granular Tin, Cowage, *&c.*, followed by drastic purgatives.

ii. *True Anthelmintics*:—Substances poisonous to parasitic animals:—Oil of Turpentine, Tar and Tar water. Creasote, Animal oil or Dippel's oil; Chenopodium or worm-seed, or its oil; Spigelia or Pink-root, Male fern, bark of Pomegranate root, bark of the root of Azedarac, Fucus helminthocorton, Corsican Wormweed, Tanacetum vulgare, common Salt, Kousso.

iii. *Purgative Anthelmintics*:—Calomel, Jalap, Scammony, Castor oil, Aloes, Hellebore.—Most efficacious when following the exhibition of the preceding.

iv. *Medicines preventing the formation of Worms*:—Assafœtida, Myrrh, the preparation of Iron, Tar-water, Charcoal; Quassia, and bitter tonics.

Class XVII. Preventing or correcting a Tendency to a Dissolution of the Tissues, or to a Solution of the Vital Cohesion of Textures—Antiseptics.

The Substances classed as *Astringents* and *Tonics* (Class IV.) are also more or less *Antiseptic*.

i. *Mineral Antiseptics*:—The Chlorides of the alkalies, the Hypo-chlorides, Chlorine and Chlorinated fluids, the Chlorides of the metals and of the metalloids, the Tincture of the hydrochloride of iron, the Chloride of Zinc, the Mineral Acids.

ii. *Vegetable Antiseptics*:—Tar, Turpentine, Tar water, Creasote, Charcoal, Camphor, the astringent and tonic Barks, Quina, Beebirine, Tannin, Gallic, and Gallic Acids.

Class XVIII. Neutralizing Acidity, removing or preventing Antacids.—Sorbefacients.

i. *Direct Antacids*:—The Alkalies and Alkaline Carbonates, the Carbonates of Iron, of Zinc, of Bismuth, Magnesia, Lime and their Carbonates, Lime-water.

ii. *Indirect Antacids*:—The Mineral acids, Tonic and Bitter Infusions, Tonic Mineral Salts, Sulphate of Quina, &c.

Class XIX. Destroying or removing, or counteracting an infectious Seminium or Miasms.—Disinfectants.

i. *Destructives*:—Heated air from 180° to 254°.—This is the only real disinfectant. All other substances, which have been extolled as disinfectants, act merely by *removing* offensive odours, or by *fortifying* persons exposed to infection against its invasion. The medicines enumerated in Classes iv. vii. and xvii., by increasing the vital tone and cohesion of the tissues, enable the body to present a greater or less resistance to the impressions made by infectious miasms, and in this they are aided by mental excitement and confidence, and by the several stimulants and tonics, when these are so employed as not to be productive of consecutive exhaustion.

In the above attempt at classifying Therapeutical Agents, I have departed far from previous arrangements. Certain *Classes* or *Orders* have been created, whilst others have been omitted: of the former there is little to be remarked, and that little will be seen by the reader who is acquainted with the subject. I have omitted the *Class*, *Antispasmodics*, because there is really no class of medicines which possesses the property of directly arresting spasm; substances which have acquired this appellation, possessing their only claims to it by their contingent action on the morbid conditions productive of spasm. Some writers have created a class of *Revellants* or *Counter-irritants*. But revulsion, or counter-irritation, is merely the employment of means comprised in Classes v. vii. and viii., in such a manner as to induce irritation and consecutive vascular determination to parts at a distance from the seat of morbid action, or to solicit an increase dflow of blood to viscera or organs, by promoting or exciting their functions. It will be perceived that I have arranged several substances under more than one class. This necessarily follows the varying and even different action of the same substance, according to its dose and modes of exhibition or combination. For very enlightened views as to the operation and classification of Therapeutical Agents, I may refer the reader to the more recent works on Therapeutics and Materia Medica, enumerated in the Bibliography.

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THROAT, DISEASES OF — Comprising the Tonsils and Pharynx.

1. *The parts*, of which the throat may be said to consist — The *velum* or soft *palate* and *uvula*, the *tonsils* and pillars of the palate, the *pharynx*, and the *root* of the tongue and *epiglottis* — may individually, or severally, or even altogether, be the seat of disease, especially of the various forms and states of inflammation, or of ulceration, or of sympathetic functional disorder. Whether they be individually or conjointly affected, the disease may be either *primary* or *consecutive* — *idiopathic* or *symptomatic* — *simple* or *complicated* — *local*, or *constitutional*, or *specific*, — and, as respects the state of vital power, *sthenic*, or *asthenic*, or *phagedenic*, or *gangrenous*. This last or malignant form is generally a manifestation of a general or specific contamination of the circulating fluids, in connection with reduced or perverted organic nervous power or vital action. It is comparatively seldom that one only of the parts comprised by the generic term, *Throat*, is affected, the others remaining healthy. Most commonly adjoining parts are more or less implicated; and, not infrequently in consequence either of previous disorder of the digestive functions, or of impaired vital power, or of interrupted excretion and morbid states of the blood, the disease extends to all these parts, and even still further, as to the œso-

phagus, or to the larynx and trachea — to both the digestive and the respiratory passages, especially during wet and unhealthy seasons and epidemic influences, and in low, humid and malarious localities. — Under the head PALATE and UVULA I have treated of *Relaxations* and *Inflammations of these parts.* — I have now to consider the *inflammatory and structural changes of the Tonsils* and *Pharynx*, and the *diseases of the throat*, which are not limited to one or other of these, but which often extend also to the palate, and even also to the epiglottis and larynx in one direction, and to the œsophagus in another.

I. INFLAMMATION OF THE TONSILS. — SYN. *Tonsillitis*, from *Tonsillæ*, the *Tonsils*. — *Synanche vel Cynanche Tonsillaris; Angina Tonsillaris*, Auct. — *Angina cum tumore; Amygdalite*, Fr.

CLASSIF. — III. CLASS. I. ORDER (*Author*).

2. DEFINIT. — *Pain or uneasiness in the seats of the Tonsils, with redness, enlargement, and often with difficulty of swallowing and fever, terminating in resolution, abscess, or chronic enlargement.*

3. The *Tonsils* may be inflammed alone or chiefly, or in connection with other parts of the throat, most frequently with the fauces or pharynx, or both, especially where affections of the throat are epidemic, or complicate febrile and exanthematous maladies. Both tonsils are generally affected either contemporaneously or in succession. One only is rarely attacked, — not more than one in 15 or 20 cases.

4. *A. The causes* of Tonsillitis are nearly the same as those occasioning inflammation of other parts of the throat. The disease is not frequent in young children; it is rare during the period of lactation; but it becomes more and more frequent from five to ten years, and still more so from ten till about 20. From the latter age, or from 25 to 30, its frequency diminishes, until it is rarely seen at ages upwards of 50. It is nearly equally prevalent in both sexes; but the male sex generally furnish the greater number of cases, probably from a more frequent exposure to the exciting causes. Seasons of the year, states of weather and locality, favour its prevalence, so much so as to render it epidemic or endemic. Epidemic visitations of the malady have mostly occurred in spring or autumn; and although the disease appears at all seasons, it is most frequent when the weather is cold, wet, or changeable. Cold and humid situations, wooded and miasmatous places, and clay or absorbent soils, favour its prevalence. It affects most frequently persons of a fair complexion and those of the scrofulous diathesis; and it often recurs in the same individual, from exposure to cold or currents of air, especially when overheated or perspiring, or when the digestive functions are disordered.

5 *B. The symptoms* of Tonsillitis sometimes commence without any very manifest previous disorder. In other cases they are preceded by slight derangement of the digestive functions; and occasionally by most of the phenomena which usher in other inflammations, especially by chills or shivering, followed by heat of skin, excited pulse, thirst and headache; or merely by general uneasiness, by want of appetite, and pains or soreness of the limbs. Rapidly following, or even coëtaneously with these, more or less difficulty of deglutition, and a sensation as if a foreign body were present in the throat, are experienced; and, in a few hours, or in one or two hours, a continued pain, at first moderate, sometimes severe or acute, a sense of heat, and a constant desire to swallow, are complained of. Deglutition becomes so difficult and painful as to occasion, in some cases, contorsions or convulsions; and in others it is impossible. A guttural cough, a frequent desire of expuition, or of rejecting the saliva and the increased secretion from the throat; a hoarse and difficult respiration; and obscured, confused, or whispering and guttural articulation, or a voice entirely suppressed or lost, are generally present in the more severe cases. In some instances, when the tumefaction of the tonsils is very great, and the discharge of the secretions from the throat and mouth is difficult, paroxysms of dyspnea, or of threatened suffocation, occur at intervals and heighten the distress and alarm of the patient.

6. When the patient's mouth is opened and the base of his tongue depressed, the tonsils are seen more or less swollen, protruding from between the pillars of the palate, and nearly approaching or even touching each other. The membrane covering them partakes in the inflammation; and is at first red and dry; but it afterwards is partially covered by whitish exudations, or by specks or patches of mucus or of lymph, or even by a membranous coating of these. In some instances, however, the tonsils continue more or less free from exudations, and present a deeper and darker red as the disease proceeds. In most cases the inflammatory appearances are not confined to the tonsils, but extend also to the soft palate and uvula; and there is every reason to infer, from the extension of pain to the interior of the ear, the crepitations which are heard, and the deafness complained of, that inflammatory changes then extend to the Eustachian tube at least, and even in a slight grade to the interior of the ear. When one only of the tonsils is attacked, the enlargement may be so great as to pass the mesian line and to push the uvula to the sound side. The patient in such cases inclines his head from this side, in order that deglutition may be less painful. When both tonsils are affected as is most commonly the case, and the swelling is great, the uvula is either thrown backwards and is concealed behind them, or it is wedged between and above them and contracted. Frequently the enlargement of the tonsils is so great and so painful as to render it difficult to open the jaws so far as to see the state of the parts; but generally this may be ascertained by the introduction of the finger.

7. In addition to those more strictly local symptoms, others of a more sympathetic nature are often present. These are chiefly flushing of the face, headache, thirst, loss of appetite or nausea, heat and dryness of the skin, scanty high coloured urine, costiveness. In some cases the patient cannot swallow even fluid food, and a few attempts at deglutition are followed by the forcible rejection of the substances taken, through the nostrils. When this occurs, it may be inferred that the pharynx is also inflamed. The character of the *symptomatic fever* varies remarkably. In persons previously healthy, and in open and high localities, the febrile diathesis is generally *sthenic* or *phlogistic*; but in the delicate or cachectic, and in the inhabitants of large towns, or of low, close, or humid places, the attending fever is of a lower or more *asthenic character*, and the local symptoms

are more extended to parts in the vicinity. In a few cases, and these the most robust, the febrile action is very slight, although deglutition may be altogether prevented by the swelling. In such cases the patients complain of hunger from this deprivation.

8. *C.* The *course* and *duration* of Tonsillitis is usually acute; and generally extends from seven to fourteen days. The disease may *terminate* in five or six, and it is rarely prolonged to twenty-one days. The symptoms commonly become more and more severe during the first third or half of their duration. They then continue stationary for a time, and subside afterwards with greater or less rapidity. When the disease is slight or moderate, or when the case is early and judiciously treated, then resolution takes place and the swelling gradually and quickly subsides. But in the more severe attacks suppuration commonly supervenes in one or both tonsils; and is indicated by a change in the nature of the pain, which passes from an acute and pulsating, to a dull or heavy character; and sometimes by chills or chilliness, slight rigors, and a general perspiration. The difficulty of swallowing continues or increases; and, upon introducing the finger, a softness, or even fluctuation of one or both tonsils may be felt. When the parts can be brought into view, the part to which the matter points may sometimes be seen. The spontaneous rupture of the abscess, when it is not opened immediately upon ascertaining the presence of matter, occurs either when retching or vomiting, or when coughing or speaking, or when attempting to swallow or to throw out the secretions from the throat. But the abscess may break during sleep, the matter having been insensibly swallowed, and the patient feeling greatly relieved when awakened. If the abscess thus breaks spontaneously, the matter is usually fœtid and offensive from its retention, the fœtor sometimes being the only indication of the rupture, when the quantity of matter is small and mixed with the secretions from the throat and mouth. Instances are rare, in which the matter makes its way externally, or at the lateral and upper region of the neck; but it has thus made its way either in one or in both sides, especially when a diffusive inflammation of the adjoining cellular tissue has occurred in connection with the suppuration of the tonsils, particularly in the more malignant exanthematous complications of the disease; and in still rarer cases, the matter has found its way along the vessels of the neck, into the chest.

9. Inflammation of both tonsils sometimes terminates differently as respects each; one terminating by resolution, the other by suppuration. Gangrene takes place rarely, and only in the malignant and complicated states of the malady. The termination of tonsillitis in *chronic enlargement* of the parts, is not infrequent in scrofulous and cachectic subjects, and after repeated or periodic attacks. These returns of the disease may be more or less frequent, or at certain seasons, or at uncertain times: they may recur, and leave the tonsils either in a healthy state, or more or less enlarged, the enlargement increasing and becoming more permanent after each attack. This is frequently the case after a recurrence of the complaint, the previous affection, or an existing enlargement predisposing to subsequent attacks, so that the disease assumes the character of a remittent chronic tonsillitis. This is most apt to occur in the scrofulous diathesis, and in young persons of delicate constitution and weak digestive functions. In these more especially the enlargement may become permanent and more or less embarrass .deglutition and affect the voice and speech.

10. *D. Enlargement of the Tonsils* commonly proceeds from changes which are purely inflammatory or the consequences of inflammation, although *other* changes also produce it in rarer instances, as is shown by he examination of cases, in which a fatal result has followed some other intercurrent or complicating disease. The appearances which proceed more strictly from inflammation, are thickening and injection of the membrane enveloping the tonsils; infiltration of a gelatinous and yellowish serum giving rise to thickening, enlargement, and induration in the cellular tissue situated between the follicles which constitute these organs, and purulent infiltrations or collections in the same situation. The parietes of the follicles are also sometimes thickened and indurated or softened. In those cases which are still more chronic and appear independently of inflammation, or in which inflammatory action is either doubtful or has long subsided, concrete friable matter, very closely resembling tubercular matter, is found in one or several of the lacunæ of the tonsils. When it is found in one cavity, the collection may be more or less considerable, and may have formed either in a single lacuna, or in several, the partitions between them becoming absorbed, and a single cavity being thus formed.

11. II. Inflammation of the Pharynx.—Syn. *Pharyngitis* (from φάρυγξ, the posterior part of the throat); *Cynanche Pharyngæa; Angina Pharyngæa; Dysphagia Inflammatoria,* Auct.;—*Angine Pharyngée,* Fr.;—*Schlundentsündung,* Germ.

Classif.—III. Class.—I. Order (*Author*).

12. Definit.— *Soreness or pain referred chiefly to the posterior portion of the throat, with increased pain and difficulty when swallowing, the substances taken being sometimes forcibly ejected through the nostrils; constitutional disturbance often slight, but oftener very severe or dangerous.*

13. *Pharyngitis* occurs in a great variety of forms, circumstances, and complication. It may be *mild, slight, catarrhal, primary, consecutive;* and *associated* with other disorders or maladies. It may exist *singly* or simply, or be *associated* with inflammatory action more or less manifest or pronounced, in either the soft palate or fauces, or in the tonsils, or even in the œsophagus, or in the larynx and epiglottis. The simple or unassociated state of the disease is much less frequent than the associations now mentioned, and of these the most common are those in which the soft palate and tonsils are more or less prominently affected. Pharyngitis in its simpler states is often symptomatic of disorder of the digestive functions, especially of severe or protracted indigestion; or of the more acute states of dyspepsia following an excessive indulgence in rich food and vinous or spirituous liquors; the eructations of irritating gases and fluids from the stomach, in these cases inducing irritation and inflammation of the pharynx. Pharyngitis in its associated

states presents every grade of severity, and all the forms or characters which are observed in diseases usually denominated inflammatory. It may be thus *sthenic* or phlogistic, either when simple, or when associated with tonsillitis or palatitis; or *asthenic* or *malignant*, when it occurs in the course of low fevers, during disorders of the digestive functions, during morbid states of the blood or general cachexia, and more especially in connection with scarlet fevers or with any of the other exanthemata. When thus asthenic or associated the inflammatory action always is extended to the adjoining parts of the throat, not infrequently to both the æsophagus and larynx, and even along the Eustachian tubes to the ears.

14. i. *Causes.*— Pharyngitis, in its simple and primary form is rarely observed; but associated as now stated, or even appearing as the more prominent part of an inflammation extending to adjoining portions of the throat, or even further, it is of frequent occurrence; and owing to the functions of these parts, and even of others in the vicinity, it is of much greater importance than has hitherto been attached to it. The most common manifestation of the disease is the *catarrhal;* and although it may be the chief affection, it is when thus characterised generally associated in the manner just stated. When pharyngitis is *mild* or *catarrhal*, it usually proceeds from exposure to cold in some form or manner (§ 4.). When more or less limited, it is frequently consecutive of acute attacks of indigestion, caused by the ingurgitation of too much food or fermented liquors; or it is more directly produced by swallowing acrid, corrosive, or irritating substances. Thus it may be caused by hot water; by acrid poisons, taken intentionally or by mistake; by mustard, given as an emetic in cases of narcotic poisoning; and by hot spices, or irritant medicines exhibited in excessive doses. In those circumstances, although the pharynx may be chiefly affected, the soft palate and œsophagus may be more or less implicated with other adjoining parts. *Catarrhal* pharyngitis generally proceeds from the same causes as those which produce tonsillitis, especially from currents of cold air passing over or near the neck or throat, from wet feet or damp clothes, from cold and wet seasons, and from changeable weather, especially about the equinoxes, when it is often epidemic. The more severe and dangerous forms of pharyngitis are those in which this local affection is merely a prominent manifestation of a constitutional or febrile malady, as in scarlet fever, small-pox, measles, scurvy, erysipelas, and other diseases in which the circulating fluids become more or less contaminated. In these circumstance the pharyngitis is asthenic, often characterised by pellicular exudations, but frequently not so characterised; always spreading, and generally, when thus symptomatic, occurring from infection, and often as an epidemic.

15. ii. *Description.*—Pharyngitis may be an extension of a catarrhal or mild inflammation from the fauces or tonsils, or from both; or it may be coëval as well as coextensive with these; or it may be associated with *œsophagitis* (see Art. ŒSOPHAGUS), either as the primary or the secondary affection. The catarrhal form usually commences with coryza and all the symptoms of a common cold or catarrh, or with those mentioned above in connection with *tonsillitis* (§ 5.).—*A.* The more acute or phlogistic form, especially when occurring in the sanguine temperament and in young robust persons, is commonly attended by symptomatic inflammatory fever ushered in by chills or rigors. With these a sense of heat, dryness, and soreness is felt at the posterior part of the throat and posterior nares, and the surface of the pharynx is seen, when the tongue is depressed, red, and injected, sometimes shining. Soreness and pain are increased by attempts at deglutition, or as soon as the pharyngeal muscles are called into action. As the affection proceeds, the pain and difficulty of swallowing increase, and substances, especially fluids, are often forcibly rejected by the nostrils. When the inflammation is severe, the pain is often referred chiefly to the neck or the anterior aspect of the upper cervical vertebræ. The heat and pain in this situation are somewhat abated as soon as the red and inflamed surface becomes covered in parts with a thick tenaceous mucous exudation. This exudation often increases, or is more and more abundant, but still viscid or ropy, and is discharged after a hacking or hawking or guttural cough; yet the disease may continue several days, or even proceed to its termination, without this secretion being very manifest or considerable. If the inflammation extends to the epiglottis and larynx, the cough is more severe, paroxysmal, or strangulating than when it is confined to the posterior part of the pharynx.

16. When the *lower portion* of the pharynx is chiefly affected, then the soreness and pain are referred chiefly to the superior part of the throat, behind the cartilages, and the increased pain on swallowing, and the difficulty of accomplishing this act, are experienced after substances have been seized by the pharyngeal muscles and are about to pass into the œsophagus, at the top of which they are felt to be arrested or to pass with difficulty. In these cases the inflammatory action often extends more or less down the œsophagus; the soreness and pain being increased upon pressing the lateral parts of the neck and throat. — In these cases the posterior part of the pharynx may not present a very marked state of inflammation, even when the root of the tongue is pressed downwards; the inflammation being often either lower down than this, or affecting chiefly the anterior parietes of the pharynx. The voice is generally but little, or not all affected; and the cough varies in severity and in character with the degree in which the epiglottis and larynx are implicated.

Whatever may be the exact seat and extent of the pharyngeal affection, the constitutional disturbance is very various, being in some inflammatory or sthenic, in others asthenic, and in many slight or very mild. The severity of the accompanying fever depends much upon temperament, diathesis, habit of body and the age of the patient. It is more generally asthenic or adynamic in the spreading and other states of the disease about to be noticed, in cachectic conditions of the frame, and when the affection is a prominent complication of other febrile and exanthematous maladies. Pharyngitis presents certain characters or forms which deserve notice.

17. *B.* The *catarrhal* is generally erythematic or superficial, and extends more or less, with an abundant secretion, to the posterior nares, the fauces,

and the tonsils. It often commences with coryza, and presents a marked tendency to extend to the larynx and trachea, and to be followed by pulmonary catarrh, or by bronchitis,—especially during cold and wet seasons, and in changeable weather, or during easterly winds.— In rare instances pharyngitis presents a distinctly *gouty* or a *rheumatic character*. Of these two forms the *gouty* is the more frequent, and is generally consequent upon attacks of indigestion, often connected with exposures to cold or wet, occurring in the gouty diathesis. The *rheumatic* is seldom observed, unless in connection with rheumatism of the face or neck, and with biliary accumulations and disorder of the digestive organs. The association of pharyngitis with *erysipelas* is much more frequent than is supposed; but this, with other states and *complications* of the disease, will be more fully considered in the sequel.

18. *C.* The *terminations* of pharyngitis are chiefly by *resolution*, by *suppuration*, and by *gangrene*.— *a. Resolution* is the common issue in the catarrhal form, the superficial nature of the affection, and the abundance of the secretion from the surface, favouring this termination, which usually occurs in a few days and is rarely prolonged beyond the fourteenth day. In most cases the inflammation is superficial, or erythematous; but in others the submucous cellular tissue is also affected, and the symptoms assume a greater degree of severity, the surface remaining longer red and dry, or subsequently becoming covered by a viscid secretion, which is detached only after great efforts and paroxysms of cough, sometimes attended by retchings.—*b. Suppuration* occurs in rare cases of pharyngitis, owing to the extension of inflammation to a portion of the cellular tissue connecting the pharynx to adjoining parts This termination is usually announced by irregular chills or rigors, by a pulsating pain or sensation in the part chiefly affected, and sometimes by sweats. The matter is most frequently formed at the posterior portion of the pharynx, or at the sides, or even anteriorly. In all cases the abscess renders deglutition difficult or almost impossible; and in the latter situations it embarrasses respiration and affects the voice and speech. The abscess may break spontaneously; but if it be not opened early, or when it cannot be reached, the matter may accumulate to a fatal extent owing to its pressure on the larynx, or it may become offensive and contaminating, or it may find its way externally at the side of the neck, or it may break into the trachea, especially when it forms in the anterior or lateral parts of the pharynx.—*c. Post-pharyngeal-abscess* is a rare result of pharyngitis; and although it generally opens into the pharynx, it may follow the course just now stated; and it may, moreover, produce disease — inflammation, caries, &c. of one or more of the cervical vertebræ. This issue is most likely to occur in the complicated pharyngitis of exanthematous fevers, especially scarlatina, in which I have met with two instances. — *Gangrene* very rarely occurs in simple pharyngitis; but it is not an infrequent termination of the severe and complicated forms about to be noticed.

19. *D. Chronic Pharyngitis.*—The mild or slight state of the disease, as well as that which is more severe, although generally terminating in resolution in a few days, sometimes becomes *chronic*, or relapses so frequently, or returns after intervals, and thus assumes first a remittent or intermittent form, and then ultimately becomes more continued and chronic. In this state of the disease, difficulty of swallowing, uneasiness, soreness, slight pain in the posterior part of the throat, relaxation of the uvula, sometimes hoarseness of voice and speech, hacking cough, and either dryness of the throat or increased secretion from the pharynx, or an alternation of dryness and augmented secretion, are the usual symptoms; and these commonly continue for a long period, with remissions and exacerbations, especially in persons suffering from, or subject to chronic inflammatory dyspepsia, or chronic bronchitis, or tubercular consumption. In some such cases, the chronic affection is readily excited to an *acute* or *sub-acute form*, by errors in diet, by cold or damp feet, by currents of air, or by any of the usual exciting causes.

20. III. INFLAMMATION OF THE THROAT WITH PLASTIC EXUDATION. — SYNON. *Plastic Inflammation of the Throat; Pseudo-membranous Inflamm. of the Throat; Angina Membranacea; Diphtheritis*, Bretonneau; *Angina Plastica; Angine Diphthéritique; A. Couenneuse; A. Pseudo-Membraneuse*, Auct. Gall.;—*Angina with pellicular exudation.*

CLASSIF. — As above.

21. DEFINIT. — *Soreness, pain and heat in the throat, often increased on deglutition; redness with an exudation of a buff or grey-coloured lymph in spots or patches, at an early stage; commencing in either the fauces, or the tonsils, or pharynx, and quickly extending to these, and often also to the larynx and œsophagus; the exudation becoming more continuous and firm, accompanied with fever, and appearing generally either epidemically or endemically.*

22. This disease has been confounded with *Croup*, on the one hand; with malignant angina or putrid sore throat, or *Cynanche maligna*, on the other. It is rarely seen sporadically, or in isolated instances; but chiefly in an endemic or epidemic form, owing to locality, season, weather, and exposure; and, even in these circumstances, the usual causes of inflammations of the throat have been concerned in producing it; more especially vicissitudes of weather, changes of season, cold and humid states of the air; low, miasmatous, and wet localities. It is most prevalent in children after weaning, and up to puberty; and it becomes less and less frequent with the progress of age. As this form of inflammation of the throat occurs endemically or epidemically, it has been viewed by some writers as infectious. The prevalence of it may, however, be assigned to local or more general causes, especially those just now mentioned. But as it is attended by much fœtor of the breath, the emanations from the affected surface occasioning this fœtor, may infect the throats of young and susceptible subjects, especially when sleeping with, or inhaling the breath of those already attacked. It may thus extend to all or the great number of the children in a family, when one is affected.

23. i. *Description.*—The *symptoms* of plastic inflammation of the throat vary much at their commencement; in some cases beginning and advancing insidiously, in others more manifestly and severely. In many it occurs with all or most of the symptoms of a common catarrh or sore throat, either with or without chills or rigors.

Generally slight soreness and pain are first experienced, with a sense of increased heat, and are increased on swallowing. Redness, of different grades, is seen in the soft palate, or its pillars or tonsils, and the uvula is relaxed. The inflammation sometimes commences in the posterior nares and extends to the pharynx, tonsils, &c.; but it more frequently begins in the tonsils and isthmus faucium, and extends to the pharynx, larynx, &c. Thus far the local symptoms are not different from those of common sore throat; but the constitutional disturbance is frequently more severe; nausea, vomiting, heat of skin, thirst, loss of appetite, and great acceleration of pulse being most frequently observed.

24. *A.* The *special* characters of the disease now supervene with greater or less rapidity. The tonsils, the velum palati, the pharynx, either successively or at the same time, present irregular patches of a yellowish, buff, or greyish-coloured exudation on the inflamed surface. These patches enlarge, coalesce, and extend to the nasal fossæ, or to the larynx with the usual symptoms of primary *croup* (see that art. § 32. *et seq.*), and often also to the œsophagus. In adults, the disease often commences in the nasal fossæ and extends to the pharynx. At the commencement of the fibrinous exudation, stiffness, soreness, and pain are experienced in the neck and throat. The face is pallid, sometimes red and swollen; the tonsils and the cervical and submaxillary glands are enlarged; and the neck is often also somewhat tumified. Deglutition becomes more difficult as the morbid exudation advances; and substances are frequently forcibly ejected through the mouth and nostrils, when attempting to swallow. On some occasions, when the disease has been epidemic, the parotid as well as submaxillary glands have been enlarged; and the membranous exudation has in a few hours extended over all parts of the throat, and occasionally over the cheeks and tongue. In some cases the morbid exudation has even appeared on the lips, in the nostrils, and behind the ears. With the development of the exudation the mucous surface, at its margin, is red and swollen. The patches become elevated, or partially detached in parts; and minute exudations of blood take place, which mix with a more or less abundant salivary discharge. The secretion in the mouth and throat is sometimes thick, viscid, frothy, and of a greyish or yellowish grey tint. In these cases it is often scanty and discharged with considerable difficulty. But in other instances, especially when the disease is very prevalent, the secretion from the throat is much more abundant, frequently serous, sanious, or sanguinolent, and always nauseous and fœtid. In the more severe and asthenic cases these characters are very marked; and a similar discharge escapes from the nostrils, epistaxis sometimes also taking place. As the disease advances, the pellicular exudation becomes detached in parts, and is discharged with the saliva and morbid secretion. Very frequently the exudation is formed anew, on the surface from which a portion had been detached; and this reproduction of it may take place in the course of a few hours, and even for the third time, each successive exudation being more scanty or thin. The disease may continue in this state from eight to twelve days, the exfoliation of the pellicular exudation going on the greater part of the time. But sometimes the exudation softens, or breaks down, in the course of three or four days, or even in a shorter time mingles with the more fluid discharge from the inflamed surface, and is thus discharged, without presenting a continuous or membranous form. M. GUERSENT states that, when the exudation is only slight or partial, it is sometimes absorbed as the disease subsides, and is not thrown off. With the resolution of the affection of the throat, the swelling of the neck and of the glands and the painful symptoms subside.

25. *B.* The *constitutional symptoms* vary much with the vital energy of the patient, with the predisposing, endemic, and exciting causes, and with the character of the prevailing epidemic. In some cases, the disease presents a *sthenic*, or phlogistic, or sthenically inflammatory condition; in others, it is *asthenic*, or putro-adynamic, or intermediate between these extremes. The *former* occurs most commonly in sporadic cases, in strong or robust subjects, and in the well-fed, plethoric, and sanguine. In these the attending fever is inflammatory; the face is red or flushed; the pulse frequent, full, and strong; and the skin dry and hot. There are thirst, scanty urine, and costive bowels. The local symptoms are generally severe, and the membranous exudation is firm and continuous, and rapidly and largely developed. The *latter* appears chiefly in cachectic, weak, or delicate or ill-fed subjects; in low, close, and miasmatous localities; in over crowded or ill-ventilated apartments, &c., and in epidemic visitations of the malady. In these circumstances the face is tumid, or bloated, or pale; the neck is swollen; the flesh soft or flabby; the pulse is quick, soft, small, or weak; the skin hot; and the excretions offensive, scanty, or irregular. The discharge from the mouth is serous or sanious, and extremely offensive; a similar discharge often taking place from the nostrils. In these the exudation is much less consistent, sometimes pultaceous, more readily breaks down and mingles with a more offensive and a more abundant discharge from the throat, than is observed in the sthenic forms of the malady.

26. *C.* A *less acute*, or a *sub-acute variety* — a milder form of the disease—is sometimes seen, in which the local and constitutional symptoms are less severe, less rapid in their development, and more insidious at their invasion and in their early progress, than in the forms just described. In this the affection of the throat is either more confined to one part, or is attended by much less exudation and fluid secretion. The pain and difficulty of swallowing are not considerable, and the swelling of the neck and glands not very remarkable. The febrile symptoms are often slight, although the debility is frequently great. The symptoms of the disease, both local and constitutional, thus vary remarkably, according to the extrinsic and intrinsic circumstances of individual cases, and to the intensity of the causes, from the most mild to the most acutely and rapidly phlogistic, on the one hand, to the most putro-adynamic on the other.

27. *D. Termination and Prognosis.*—The pellicular forms of inflammation of the throat are all more or less dangerous. But the danger arises chiefly from the frequency of the extension of the inflammation to the larynx; a contingency which may occur in the most severe cases, even in a few

hours, after the full manifestation of the malady, and which is more frequent in some epidemics and seasons, than in others. In many instances, the extension of the disease to the larynx, as described in the Art. Croup, (see § 12. *et seq.*), is the earliest indication of the nature and danger of the affection; the antecedent symptoms having been overlooked, owing to their mildness, or the very early age of the patient. The disease is most frequently fatal in these cases; and when it attacks delicate or badly nourished children, or those weakened by previous diseases. It is less dangerous in adults, unless the constitution has become cachectic or debilitated, or injured by dissipation, or the blood contaminated by neglect of the depurating functions. In these cases, the morbid process may advance not only to the larynx, but also to the trachea and bronchi, and even to the pharynx and œsophagus. The intense states of the disease may *terminate* in twenty-four hours, when the larynx is implicated, but more frequently from the 3rd to the 7th day. The less violent attacks may be prolonged until the 14th, or even the 21st day; but seldom beyond the latter period. The disease very rarely assumes a chronic form.

28. The termination of the disease by *resolution* is attended by detachment of the pellicular exudation, either spontaneously, or by the aid of treatment. It most frequently occurs from the 7th to the 21st day; but it is often hastened even before the former period by local treatment. The greyish or brownish flakes of exudation, when detached, leave the mucous surface of the guttural fossa of a uniform red or rose colour, and covered in parts by a puriform mucus. The tonsils are often enlarged, or sometimes contain a small collection of matter. In some places, erosions appear, especially where the exudation was longest and most firmly attached; but these are either very superficial or illusory.

29. When the affection implicates the *larynx*, the patient is seized with a short, dry, sibillous, or wheezing cough, which recurs frequently in short paroxysms; and is soon followed by aphonia, and a sense of impending suffocation (see Arts. Croup, § 12. *et seq.* and Larynx, § 55. *et seq.*). In children and infants, asphyxia with convulsions may rapidly terminate life; but, in adults, the disease more frequently is either arrested, or it extends along the trachea, the exudation becoming more fluid or less consistent, and assuming the appearance at first of a viscid mucus. It thus often advances to the bronchi on both sides, and sometimes terminates in *bronchitis* or *broncho-pneumonia*.

30. *E. The appearances after death* vary with the period of the disease at which dissolution occurred, and the states of vital power and of vascular contamination. If death have occurred at an early period, owing to the extension of the pellicular exudation to the larynx, the mucous surface and sub-mucous cellular tissue are more or less injected, the epithelium of the former being covered by a membranous exudation in more or less extensive patches. With the extension and *sthenic* character of the inflammation, the exudation is generally continuous, and is either firmly attached or partially detached, according to the duration of the disease. In the more *asthenic* cases, the exudation is more soft, pulpy, or broken down or mingled with a sanious or dirty mucus; the mucous and sub-mucous tissues being dark, livid, congested, sometimes ecchymosed or infiltrated with serum or blood, or with both, and often as if excoriated; the mucous surface being in numerous parts or spots deprived of epithelium, and eroded. These tissues are sometimes brown, livid, or of a dark grey colour, softened or friable, and emit a fetid odour. The cervical and sub-maxillary glands are much enlarged, of a brownish or violet red hue, softened, especially in their centres, and sometimes reduced to a pulpy or semi-fluid state, or to a sanious appearance nearly resembling wine-lees. The changes in this class of cases are very nearly the same as those observed in the more malignant cases of the scarlatinous cynanche, and described in the article on Scarlet Fever (see § 20. *et seq.*). The lesions found in the *larynx* and *bronchi* are similar to those described when treating of inflammation of these passages, and in the Croup.

31. IV. Diffusive Inflammation of the Throat: —Synon.:—*Erysipelatous Cynanche.* — *Diffusive Angina.* — *Asthenic Angina.* — *Simple and complicated Cynanche.* — *Cynanche* vel *Angina simplex et associata.*

Classif.: — as above.

Definit.: — *Soreness or pain, with redness of the throat, increased on deglutition, accompanied with fever, and often with a diffused swelling, more or less evinced internally and externally: the constitutional affection presenting more of the asthenic, than of sthenic characters.*

32. *A. Causes.* This form of *angina* or *cynanche* is often general, or diffused, when it comes under the observation of the physician; or it may commence in the arch or pillars of the palate, or in the posterior nares, or in the tonsils, or in the pharynx, and rapidly extend from either part to the others. It may be strictly erysipelatous, or be consecutive of erysipelas of the face; and I have seen instances of its occurrence from the inhalation of the breath of patients dangerously affected with erysipelas and puerperal fever. I have most frequently met with it in persons, who have been previously attacked with scarlatinous sore throat in a very severe form, or who have been exposed to cold in some way whilst the digestive organs have been disordered, or the depurating functions impeded or interrupted; or who are living in low and close or ill-ventilated apartments, in over-crowded sleeping-rooms, or in houses the air of which is contaminated by foul privies, drains, or cesspools, in which latter circumstances especially, it often attacks several, or many persons, particularly the younger, in the same family, the delicate, ill-fed, or convalescent from other diseases, or others similarly predisposed. In these circumstances, it may be viewed as a primary or simple malady; but although it may appear as a primary, it is not a simple affection, but rather the more prominent manifestation of what is really a constitutional malady, organic nervous power and the vascular system and blood being more or less impressed and disordered. When thus apparently simple or primary, it may be either mild, or severe, or malignant, as well as when it is consecutive of erysipelas, or of scarlatina, or of small-pox, &c. In these latter or associated states, the cynanche may be said to be specific; and the specific forms may not be limited to the severe

exanthematous fevers, but extended to the *mercurial*, in which the tongue, gums, and salivary apparatus are particularly implicated, as described when treating of the mercurial Poisons (see § 568. *et seq.*), and to the *syphilitic*, as shown in the Art. on Venereal Diseases.

33. The infectious nature of the diffusive form of cynanche, as well as of that next to be noticed, has been affirmed by some writers, and disputed by others. This difference of opinion is chiefly owing to the circumstances under which both the one form and the other generally appear. The local causes most frequently originating diffusive cynanche independently of the scarlatinous infection are such as often affect a greater or less number in one house or family; but instances have occurred of a person having transmitted the disease to others differently circumstanced as respects these causes; although it has rarely proceeded to a third series of subjects, unless the predisposing and existing causes were present, due ventilation and dilution of the contaminating emanation preventing infection. This form of cynanche, moreover, is very frequently a form merely of scarlet fever, the cutaneous affection being either wanting or overlooked; the spread of the disease being attributable rather to the fever, than to the state of the throat. But when, in simple diffusive cynanche, the disease is severe or malignant, or is attended by any degree of fœtor, the risk of infection should be dreaded, and the unaffected ought to avoid the inhalation of the breath of the affected; for I have seen this form of cynanche thus communicated when there was not the least evidence of a scarlatinous origin having been connected with it. This form of angina, moreover, may be caused by suppression of the catamenia; and it is not unfrequently favoured by, and complicated with, the gouty diathesis, and by biliary disorder.

34. *B. Symptoms.*—These vary with the causes, with their intensity or concentration, with the season, weather, and endemic or epidemic influences, with the predisposition and with pre-existing disorder. This affection may be slight, as in most cases of the catarrhal form. It is generally more severe in the morbillous or variolous states; and it is often most severe or even malignant or gangrenous in the scarlatinous and erysipelatous. Diffusive cynanche may be either mild or severe—also in the simple or uncomplicated states, or when it occurs independently of exanthematous infection, and is produced sporadically or endemically from the contaminating or poisonous causes already mentioned (§§ 32, 33.). It is, however, in the more complicated states, especially in the erysipelatous and scarlatinous, that the adjoining cellular tissues and glands are most liable to be infiltrated, contaminated, and softened; the organic nervous power to be depressed, and the circulating fluids to be altered. Generally in proportion to the severity of the local affection—to the diffusion of the inflammation—to the swelling, lividity, pain, heat, and difficulty of swallowing, and to the fœtor of the breath, are the febrile symptoms developed; the pulse being quick or rapid, the heat of surface increased, and the secretions and excretions impaired, suppressed, or interrupted. But the defect of organic nervous or vital power is more especially manifested by the softness, openness, smallness, and the great rapidity, or the unusual slowness of the pulse; these varying states of pulse depending upon the quantity and quality of the blood, as well as upon deficient organic nervous power. With the lividity of the inflamed throat, with its diffusion to the pharynx and œsophagus, or even to the respiratory passages, on the one hand, and to the mouth and cheeks, Eustachian tube and internal ears, on the other, and with the swelling of the more external parts, the febrile symptoms generally present more and more of an asthenic character; and the blood more of an impure, imperfectly oxygenated, contaminated, or poisoned condition — a condition varying according to the nature and concentration of the exciting causes, and to the extent of impaired or interrupted depuration. In this advanced stage and low form of the malady, the excretions become fœtid, especially those from the bowels; the fœtor of the breath is remarkable, and the urine scanty, high-coloured, and turbid. Sometimes diarrhœa supervenes and becomes critical, recovery either afterwards taking place, or fatal exhaustion being produced by it, accordingly as it is treated, or as the constitutional powers resist its effects.

35. *C.* The *Duration* of this general or diffusive form of cynanche is very various. If the respiratory passages become early affected, or if the disease assumes a very severe form, a fatal result may occur in the course of two or three days from the commencement of the attack; but this seldom takes place before the 5th or 6th day; and occasionally it occurs at even a much later period, owing either to vital exhaustion, to contamination of the blood as stated above (§ 34.), to lesion of the respiratory passages and organs, or to changes in the nervous centres and their membranes. Recovery generally occurs from the 7th to the 14th day, but sometimes much later. *Relapses*, or *repeated attacks*, of the disease may take place; the intervals between them varying with the circumstances or causes producing them; and the malady may even, from these and other causes, thus assume somewhat of a *remittent* or *intermittent form*, or even become *chronic*, recovery or a more acute attack supervening after an indefinite period.

36. *D. Terminations and Prognosis.* — *Recovery* often follows early and decided treatment; the inflammation of the throat presenting a less livid hue, the swelling subsiding, and deglutition becoming more easy. When these changes are attended by an improvement in the states of the pulse and skin, and in the several secretions and excretions, then this result may be expected with certainty. More unfavourable symptoms even than those already mentioned sometimes appear, and indicate irritation of the nervous centres, either by the contaminating operation of the miasms causing the disease, or by the interruption of the depurating functions; the blood in either case being affected, and vital power depressed. These symptoms are convulsions in children; delirium and restlessness in young persons and adults; followed by stupor, coma, pickings of the bed-clothes, &c. These generally follow rapidly upon the extension of the inflammation, or rather of the local morbid action to the œsophagus, to the larynx, and trachea, and to the Eustachian tubes and internal cavities of the ears. The severity of the local symptoms, the diffused swelling

Produced by the infiltration of the sub-mucous cellular tissue, as well as by capillary injection and congestion, and the viscid exudation from the diseased surface, increase all the symptoms connected with deglutition and respiration, and often threaten, and sometimes occasion, death by asphyxia, especially in children and young subjects, convulsions often also accompanying this event. The danger is generally great in proportion to the difficulty of respiration, to the dark hue and swelling of the throat, to the fœtor of the breath, to the tumefaction of the sub-maxillary regions and neck, and to the weakness, smallness, and frequency of the pulse. Lividity of the face, lips, and tongue; a dirty, dark hue of the general surface, and blueness of the fingers and nails, are commonly fatal signs. Suppression of urine, and involuntary or unconscious intestinal evacuations, are also indications of impending dissolution, especially when they are preceded or attended by the foregoing symptoms.

37. The dark colour of the throat, the sanious discharge from the mouth, and the gangrenous or fœtid odour of the breath, have induced a belief, especially among some writers of the last century, that *gangrene* or sphacelation of one or more of the parts affected supervenes and occasions death. But actual sphacelation of any of these parts rarely occurs during the life of the patient; although the swelling, sanious or sero-sanious infiltration, and softening of the parts, are sometimes initiative of this alteration, and approach it more or less soon after dissolution. In the rare cases in which sphacelation of a portion of the inflamed surface takes place, a slough usually sufficiently apparent is formed, and, if the treatment be active and judicious, it is thrown off, leaving an ulcerated cavity or loss of substance more or less manifest according to the amount of the disease. In these cases, the danger may be less (recovery sometimes occurring) than when the morbid action is more diffused; the constitutional symptoms, or those connected with the nervous and vascular systems, and with the state of the blood and of the excretions, evincing by their severity a greater amount of risk than is denoted by the local sphacelation. This alteration, instead of constituting a distinct variety of cynanche, is merely an accident, or result seldom supervening, and is as likely to occur in one form of the disease as in another, although it is consequent upon the severity of the local affection, whether that affection be simple, or complicated with scarlatina or scurvy, or any other constitutional malady. The *phagedenic* or gangrenous stomatitis, affecting in rare instances infants and young children (see Art. STOMATITIS, § 24. *et seq.*), sometimes extends to the fauces and throat, if it be not quickly arrested, and the poisonous action of mercurials particularly in this class of subjects, and in adults who are susceptible of this action, is occasionally exerted in the throat and mouth in this destructive manner.

38. *E. The associations or complications* of inflammatory affections of the throat, in their partial or more general forms, are very numerous. They are commonly at first *symptomatic* manifestations of a more general or of a febrile nature; and they not unfrequently become most troublesome and even dangerous complications, not merely from their severity, but also from their extension, as shown above (§ 36.) to one or more of the passages leading from the throat to other organs, and even to those organs themselves. In the exanthematous order of fevers, and sometimes also in the more simple continued fevers, these affections are often most serious complications. They are still more particularly so in scarlet fever, and sometimes in erysipelas of the head and face. They are often present in scurvy and other forms of cachexia; and they are frequently associated with the inflammatory states of dyspepsia, and in gastro-enteritic disorders, both acute and chronic. In many organic maladies seated in the abdominal and respiratory organs, chronic affections of the throat, and sometimes also of the mouth and tongue, often supervene, especially at a far-advanced stage of these organic maladies, and indicate depressed organic nervous power, and change of the circulating fluids; thus evincing an unfavourable and generally a fatal issue. The affections of the throat and mouth, in the advanced course of these maladies, especially of tubercular diseases of the lungs, often assume an aphthous appearance, and increase the distress of the patient.

39. V. TREATMENT.—i. OF TONSILLITIS.—The treatment of tonsillitis is nearly the same as that of other forms of angina.—*A.* At the commencement of the complaint *acidulous* and *demulcent*, or *emollient fluids* may be used; and the open mouth may be frequently held over a basin containing about half a scruple or scruple of camphor and an ounce of vinegar, on which about a pint of boiling water is poured, the patient directing the *fumes* from these towards the throat by placing half a sheet of paper before and above his open mouth, and under his nostrils, so as to allow respiration to be free. If the *vapour* from these excite cough (which it will not occasion if the paper be adjusted over the upper lip, so as not to allow the fumes to be respired by the nostrils) either the quantity of water may be increased, or that of the other ingredients diminished. A sufficiently active aperient and alterative pill ought to be given at bed-time, and a *purgative* draught in the morning; and the feet and legs should be plunged in warm water, containing salt and mustard, the *pediluvium* being repeated according to circumstances. In mild cases, or in delicate persons, these means, aided by *diaphoretics*, and by *embrocations* to the throat and neck, will generally be sufficient to remove the complaint; but in strong, robust, and sanguine habits of body, or when the febrile action is considerable, is sthenic or phlogistic, *venesection*, or *leeches* applied behind the ears, or both modes of depletion may be practised. In large towns, and in persons living in low, close localities, and in the insufficiently nourished, *blood-letting* is as often injurious as beneficial. For males, *cupping* on the nape of the neck — the quantity of blood taken by it having due reference to the state of the patient — should be preferred; but for females, neither this mode of depletion, nor the application of leeches to the neck, is eligible, on account of the marks which are left by them. For these latter, therefore, *bleeding* from the feet whilst they are plunged in warm water, or the application of a few leeches below the groins, especially if the catamenia be delayed, suppressed, or difficult, or scanty, should be preferred. I have never seen much benefit derived from the application of leeches to the

neck in tonsillitis: and the recommendation of some writers to apply them to the inflamed tonsils is generally repugnant to the patient, and is seldom advantageous.

40. *B. Fomentations* and *poultices*, of an irritant nature by some, and of an emollient kind by others, have been advised; either of these may be of service, and either of these may be quite useless. I have generally prescribed *terebinthinate epithems* and *embrocations* to be applied around the neck, two or three folds of flannel being moistened by the substances prescribed, and covered by a napkin or handkerchief. These substances, conjoined with the turpentine, have been varied according to the features of the case, as directed in various parts of this work, and in the Appendix (see *Form.* 311.); and are beneficial in all the forms of angina. They may be so prescribed as to produce erubescence of the external surface, or as not to occasion this effect, according to the intention of the physician. In addition to the use of laxatives and aperients, or purgatives, and of diaphoretics, it has been usual to prescribe *gargles* to the throat. I have seldom seen them of much service. But refrigerant and emollient fluids, in the severe and *sthenically* inflammatory cases, as the nitrate of potass, solution of the acetate of ammonia or muriate of ammonia and mucilage, in camphor mixture, may be taken frequently, and held in the throat for some time, whilst the head is thrown back, before they are swallowed, or before they are thrown out.

41. *C.* The more *asthenic forms* of tonsillitis occurring in weak, ill-fed, or cachectic persons, or in those weakened by a foul atmosphere, or by previous disease, ought not to be treated by local or by general blood-letting. After the excretions and fæcal accumulations have been duly evacuated, organic nervous power and the depurating functions should be promoted by suitable means; and the local extension of the morbid action ought to be prevented by the applications which have been found most successful in attaining these ends. The action of the excreting organs should be increased by conjoining *tonics* with *aperients*, and these with the *alkaline carbonates*. These medicines may be taken at night or early in the morning, or at both periods; whilst the decoction of *cinchona*, with the compound tincture of cinchona and the solution of *acetate of ammonia*, may be given during the day. In many cases, the dilute *hydrochloric acid*, or the nitro-hydrochloric acids, or the pyroligneous acids, may be substituted for the acetate of ammonia; and each dose of such mixture may be held for some time in the throat, as just advised, before it is swallowed; or the same mixture may be used very frequently as a *wash* for the throat whilst the head is thrown back, and be afterwards ejected. I have in these cases also prescribed the sulphate of quina with compound infusion of roses, dilute sulphuric acid, &c.; but I have had reason for preferring the medicines now advised, to this last. In the more asthenic — in the gangrenous, putro-adynamic or malignant, as they have been termed — still more *astringent* and *antiseptic gargles* or *washes* for the throat may be prescribed, especially those with krameria, capsicum, sulphate of zinc, &c.; or those with the chlorides, or with chlorinated water or solutions; or others with decoctions of bark and pyroligneous acid or creasote. I have used with much advantage in those cases gargles and washes with strong *tar water;* and when this last is not too strong to swallow, then a portion of it will generally be taken into the stomach with manifest benefit. In these cases, also, the *fumes* arising from hot water poured over camphor, with myrrh, vinegar, or pyroligneous acid, and a little creasote, may be inhaled or passed into the throat, as directed above (§ 39.), or the weak fumes of tar may be similarly used — or the vapour of hot water poured on tar.

42. Several other measures, besides those now mentioned, have been prescribed for tonsillitis. Dr. Monoe has advised the tonsils to be *scarified;* and in the more chronic and indurated states of the disease this may be of service. M. Ranque prescribed the *pyroligneous acid* to the inflamed tonsils; M. Laënnec, of Nantes, the insufflation of *powdered alum;* M. Bennati, *gargles*, with a strong solution of alum; and M. Guyton-Morveau, powdered *carbonate of lime*. These, as well as other applications about to be noticed, are more beneficial in the chronic enlargement of the tonsils, than in the acute or early inflammations of those organs. *Gargles* of various kinds have been advised by numerous writers since the days of Hippocrates and of Avicenna — cooling and emollient gargles in the more sthenic or phlogistic cases; warm, stimulating, and antiseptic gargles in the asthenic or malignant; and astringent gargles when the disease is attended by relaxation. *Dry-cupping* on the neck has been recommended by Hippocrates, Aretæus, Paulus Æginetus, Kortum, and others; but to be useful it should be often repeated. *Emetics* were much used by the older writers in all inflammatory affections of the throat. They are most beneficial when such affections are complicated with torpor of the liver, or with biliary accumulations in the gall-bladder and ducts. When exhibited after the formation of matter in the tonsils, they generally occasion rupture of the abscess and immediate relief. *Blood-letting* has been very generally employed for the sthenic forms of guttural disease. Hippocrates, Celsus, Aretæus, Cælius Aurelianus, Alexander Trallianus, Avicenna, and many writers of the 16th and 17th centuries, advised the blood to be drawn from the sublingual veins; but the practice has fallen into so complete disuse, that no one at the present day is able to give an opinion as to its merits. Bleeding from the feet was likewise advised by many writers; but not so generally as bleeding from the raninal veins.

43. *D.* When the disease has passed on to suppuration or to *abscess of the tonsils* (§ 8. *et seq.*), as it generally does if the above means fail to arrest it in a few days, then the distension attending this state almost threatens suffocation, and the cough, difficulty of breathing, or the occurrence of retchings, &c., tend to rupture the abscess, and relief is obtained. But before the distressing symptoms occur, and as soon as fluctuation is felt on applying the finger, an incision should be made for the escape of the contents. Frequently the abscess bursts before the symptoms become urgent, and the disorder soon subsides. If this should not be the case, the local and constitutional means already advised should be persevered in; and, if a chronic remittent or intermittent state of the disease follow, the means about to be noticed will

generally succeed in restoring the parts to a healthy condition.

44. ii. THE TREATMENT OF PELLICULAR OR PLASTIC INFLAMMATION OF THE THROAT has been the subject of much discussion both in this country and on the continent.—*a. Blood-letting*, general or local, or both, should be early employed when the habit of body, age and strength of the patient, and the sthenic character of the local affection and of the attending fever, indicate the propriety of the practice. But I have never seen much advantage obtained from too copious or too frequently repeated depletions in this malady. It should be recollected that the disease occurs chiefly in an epidemic form, and epidemics seldom require large depletions, even although vascular action may appear greatly excited. In these maladies the excitement greatly exceeds the amount of vital power. *Emetics* are more generally appropriate, and when blood-letting is proper, they should soon follow this measure, the terebinthinate *embrocations* already mentioned (§ 40.) being applied around the neck and throat. *Purgatives* are of use; but of much less use than in the other forms of guttural inflammation. The bowels, however, should be kept in an open state throughout the disease by medicines taken by the mouth or administered in enemata, and all the depurating functions ought to be promoted.

45. *b.* The *local treatment* of plastic angina is of the greatest importance, and especially for the severe and rapidly spreading cases. For these the dilute *hydro-chloric or nitric acids*—the dilution being less in the most severe, and proportionably greater in the milder cases—should be applied by means of a piece of sponge firmly tied on the end of a piece of whalebone. Either of these acids, or a strong *solution of the nitrate of silver*, ought to be thus applied over and around the parts covered by the pellicular exudation; and the application repeated according to its effects and the urgency of the case. It should be carried sufficiently down into the pharynx and over the base of the tongue and epiglottis to prevent the extension of the exudation to the larynx. In the milder cases, the *chloride of mercury*, or the *biborate of soda*, mixed in fresh butter, or in honey, in the proportion of from one to two drachms of the former to an ounce of the latter, will prove quite as efficacious as the mineral acid, or the nitrate. Having arrested the disease by these means, or having so employed them as to change the morbid action in the affected parts, and to prevent its extension, the treatment about to be recommended for the next variety—the simple and complicated forms of diffused cynanche—may be pursued, appropriately to the features of individual cases. In most instances, the *fumigations* and *embrocations* advised above (§§ 39, 40.) will be sufficient to restore the local affection to health, when aided by the means requisite to promote the secretions and excretions, to allay febrile action when it is materially excited, and to support vital power when it is deficient. For these purposes, the measures already mentioned and those about to be noticed are quite appropriate. MM. BRETONNEAU and GUILLON at first advised the *insufflation* of a powder into the throat consisting of either the dried sulphate of alumina, or chloride of mercury, mixed with powdered gum acacia; but it was found that the frequent passage of a portion of the powder into the larynx and trachea often occasioned unpleasant and even dangerous effects. The acids or the nitrate just mentioned—the former slightly diluted, the latter in strong solution, in the more severe epidemic cases—were therefore preferred by them and by others in this form of cynanche.

46. iii. TREATMENT OF DIFFUSED-CYNANCHE, SIMPLE AND COMPLICATED.—*A.* This form of the disease is so frequently dependent upon disorder of the stomach, or of the biliary functions, or of the bowels, or of all these, that it is very often necessary to commence the treatment with an ipecacuanha *emetic*, promoting its action by drinking a warm infusion of chamomile flowers. *Blood-letting*, in this state of the disease, is seldom required unless in persons of a gross, plethoric habit of body, when it may be advantageously employed, the quantity and mode of depletion being adapted to the peculiarities of the case. After the operation of the emetic, a full dose of calomel should be given, either alone, or conjoined with other *purgatives* and aromatics or spices, or with camphor, and according to the character of the febrile symptoms, and be followed in a few hours by a stomachic purgative draught, and by a cathartic enema, if the operation on the bowels be insufficient. The terebinthinate *embrocations* and the *fumigations* mentioned above (§§ 39, 40.) should not be omitted, and the febrile or general disturbance ought to be treated conformably with the character which it may assume. In most cases, I have found that, after the due operation of the above means, the decoction of cinchona, liquor ammoniæ acetatis, the sesqui-carbonate of ammonia, and compound tincture of cinchona, or the decoction with hydrochloric acid, &c., have soon removed all disorder. In most cases, the *washes* and *gargles* of the throat already advised, have also been of use.

47. *B. The Guttural Inflammations* which occur as *complications* of either local, general, or specific diseases, are of an asthenic or diffusive nature, and usually require the *tonic* or *restorative*, conjoined with the *alterative*, means already recommended. At the same time, the treatment appropriate to these ought to be enforced; and most commonly the measures which are the best suited to the primary disease are most beneficial for the guttural affection. In these complications, the *fumigations* of the throat, with stimulant and antiseptic substances, and *washes* or *gargles*, with similar or with astringent medicines (see §§ 41, 42.), and *embrocations* applied externally as advised above (§ 40.), are generally indicated and beneficial. The functions of the skin, kidneys, and bowels, ought to be duly promoted by conjoining such depurating medicines as the states of these functions may require, with tonics and alteratives; the best alteratives being those which depurate the blood, and at the same time neutralise or remove, or counteract morbid materials or elements which may accumulate in the blood, either previously to, or in the course of, developed forms of disease. Of these sufficient notice has been taken above, and in the article on the principles of THERAPEUTICS.

48. *C. The Diet and Regimen* for inflammatory affections of the throat differ very much in different cases. In the more *sthenically* inflammatory

the regimen should be strictly antiphlogistic; and the drinks or beverages allowed ought to be refrigerant, demulcent or emollient, either of these properties predominating according to the states of the skin and urine. When the guttural affection is *asthenic* or diffusive, the beverages or drinks may be more restorative; and when the affection is severe or malignant, or is attended by an offensive or putrid odour of the breath, then *wine* more or less diluted, may be given in the intervals between the exhibition of the *tonic* and *antiseptic medicines* mentioned above. The *diet* and *regimen* — or rather a successful adaptation of both to the intimate nature of the case — must be directed mainly by a correct interpretation of the states of the pulse and of the circulating fluids; and this interpretation can be attained only after close observation, profound thought, and diversified as well as extensive experience. The physician, thus enlightened, will adapt the means to the end, and will direct such diet and regimen as will be congruous not only with the state of the patient but also with the internal and external remedies which are prescribed. Of the regimen, the most important part is the removal of the patient, from the operation of such miasms or exhalations as may have either caused or aggravated the complaint, to a pure or temperate and dry air. In all cases, also, however slight, moderation in the use of animal food, or even a temporary abstension from this food, as well as from malt or other fermented liquors, should be enforced, unless when wine or other beverages or drinks of a restorative kind are allowed medicinally. Wine ought to be restricted chiefly to the asthenic, diffusive, and complicated cases of the malady. — During *convalescence*, the diet should be abstemious, and chiefly farinaceous. As strength is obtained, particularly after the more severe and complicated attacks, the food should be generous but digestible; and change of air, tonics, and tonic and alterative mineral waters, ought to be prescribed. Travelling, voyaging, and exercise in the open air, will also prove extremely beneficial.

49. VI STRUCTURAL CHANGES OF THE THROAT AND TONSILS.

CLASSIF.—IV. CLASS, I. ORDER (*Author*, in *Preface*).

Structural Lesions of the *Throat* and *Tonsils* are generally produced — 1st. by inflammation, — 2nd. by the syphilitic infection, — 3d. by mercurial action, — 4th. by the scrofulous diathesis and tubercular disease, — 5th. by prolonged disorder of the digestive organs, — and 6th. by mechanical injury. These lesions may be confined to the tonsils, or to the pharynx, or to two or more of the parts forming the fauces and throat. Certain of them are noticed under the heads PALATE and UVULA, LARYNX, &c., and others are comprised under VENEREAL DISEASES, the *Mercurial* POISONS, and SCROFULA, owing to their being very important manifestations of these constitutional inflictions. In the brief view which will be here taken of structural lesions of the throat and tonsils, attention will be chiefly directed to those which are produced by inflammation, by disorders of the digestive organs, and by a cachectic or morbid diathesis, the exact nature of which are often imperfectly ascer- *syphilitic* and *mercurial* sources of lesions of the throat are fully considered under the heads just referred to.

50. Organic lesions of the throat are most frequently the consequences of some form of inflammation — sthenic or asthenic, common or specific — the character, severity or the duration of which is productive of alterations in the structure of one or more of the parts in which the inflammatory action has been chiefly manifested. These consequences are, suppuration or abscess, ulceration; œdema or serous or sanious infiltration, ecchymosis; varicose state of the venous capillaries and congestion of vessels; exudations on the mucous surface of either an aphthous, pulpy or membranous nature, with or without superficial ulceration or excoriation; softening, tumefaction, pulpy degeneration and discoloration of the mucous and sub-mucous tissues; vesicular and pustular formations and ulcerations; phagedenic ulceration; sloughy or gangrenous disorganisation, or sphacelation. These changes take place independently of either the *syphilitic infection* or the *mercurial poison*; although, in addition to the forms of ulceration and other structural changes peculiar to these poisons, certain of the alterations now enumerated sometimes acknowledge the same origin.

51. i. STRUCTURAL LESIONS OF THE TONSILS AND FAUCES have been partly considered above (§§ 10. 24. *et seq.*). Superficial ulceration, relaxation of the fauces, elongation and œdema of the uvula, tumefaction and induration of the tonsils, congestion or hyperæmia of the guttural surface extending to the Eustachian tubes and to the glottis and rima glottidis, and increased mucous discharges from the affected surfaces, are the most frequent and the least serious changes which these parts undergo, and are generally the consequences of catarrhal inflammation, or of those less dangerous states of inflammation which depend upon disorders of the digestive organs, or which complicate exanthematous fevers, especially when the former of these become chronic, or frequently recur.—*A. Abscess* or suppuration has been already noticed (§ 8.) as a frequent consequence of tonsillitis. It may also, although rarely, appear in the velum palati or the upper part of the fauces. *Œdema* and *serous* or *sanious infiltration*, ecchymosis, and softening of the fauces and tonsils are most commonly the effect of the more asthenic or adynamic states of inflammation, as remarked in the guttural inflammations attending scarlatina, erysipelas, &c., or are consequent upon stomatitis, especially when occasioned by the mercurial poison. In these circumstances, the affected surface may be covered by greyish, shaggy or pulpy, dirty or sanious exudations. The plastic exudation which characterises the pellicular form of cynanche (§ 21. *et seq.*), and the changes consequent upon affections of the throat in scarlet fever, are described under their respective heads.

52. *B. Vesicular* and *pustular formations* are rarely seen, and only in the severer forms of small-pox. In these cases the mucous tissue is softened, tumefied, and often covered by a plastic mucous secretion. *Excoriations* and exfoliations of portions of the epithelium of the fauces occur in the course of many of the affections of the throat; and are often connected with the several states of exudation noticed at this and other places. *Ulceration* of the tonsils and fauces sometimes follows

the detachment of these exudations, but not so frequently as is commonly supposed; nor is phagedenic ulceration, or superficial sphacelation often seen, unless after the poisonous action of mercury, and in the complicated and malignant states of cynanche, as already shown (§§ 36—38.). The rapidly destructive ulceration which characterises *noma* or phagedenic stomatitis sometimes extends from the gums and cheeks to the fauces. The more *chronic* forms of ulceration are chiefly consequences of scrofula, syphilis, and mercurial action, and are noticed in other places.

53. *C.* In addition to *enlargement* and *induration* of the TONSILS, these bodies may contain, in their lacunæ or in their structure, substances varying in appearance and hardness from that of tubercle, to that of indurated calcareous formations — or small calculi.— They consist of concentric layers in some instances, and of agglomerated grains in others; are of a yellowish white or greyish hue; the more soft and friable resembling tubercular matter; the harder containing phosphate and carbonate of lime. They vary in size from that of a millet seed to that of a pea, and are often spontaneously detached from the tonsil. They are probably the more permanent or saline remains of small collections of pus, or of small chronic abscesses in the tonsils. Some of these contain, with the ingredients just named, a little fatty matter and a coagulated albumen. *Cysts* and *acephalocysts* are very rarely seen in the tonsils; and *cancer*, in its several forms, is as rarely found primarily in the tonsils, although it not unfrequently attacks parts in the immediate vicinity, and then often involves these organs. The tonsils and portions of the fauces may be destroyed by the ulceration produced by phagedenic stomatitis, or by syphilis, or by mercurial action, and be followed by cicatrisation; the *cicatrices* ultimately contracting so remarkably the aperture of the fauces as not to allow the passage of the more solid kinds of food; but these occurrences are very rare. Fibrous *polypi* sometimes occur in the fauces, but much less frequently than in the posterior nares; and vary in form, as well as in firmness or softness. Their investing mucous membrane is generally spongy, is often ulcerated and disposed to bleed.

54. ii. ORGANIC LESIONS OF THE PHARYNX.— These consist chiefly of *alterations of calibre*, of the changes consequent upon inflammation — especially *exudation*, *softening*, *abscess* and *ulceration*— and of *fibrous* and *malignant formations*. (*a*) *Dilatations* of the pharynx may be general as respects the parietes of the tube, and extend to the upper portion of the œsophagus, the parts thus presenting a *funnel-like shape*; or they may be partial, one side or part of the pharynx having become so much dilated as to form a *pouch* attached to the pharynx. In this latter case the muscular fibres are stretched, ruptured, or wasted, so that the pouch consists chiefly of mucous and cellular tissues; but these tissues may have been pushed out between the muscular fibres, thus forming, in the first instance, a *diverticulum* from the pharynx, that has ultimately become dilated into a pouch. The funnel-like dilutations are often the consequence of constrictions of some kind in the œsophagus. *Constriction* of the pharynx is generally a consequence of malignant disease, or of tumours pressing upon the pharynx and upper portions of the œsophagus, or of the cicatrisation following ulceration.

55. (*b*) *Inflammatory changes* are most frequently seen in the pharynx. These consist chiefly of *croupy* or *plastic exudations*, as described above (§ 20.) and in the Art. CROUP; of *aphthous exudations* in cases of thrush; and of *pustular formations* in very rare instances, in variola or after tartar emetic has been given in excessive doses. *Exudations of blood* from the throat sometimes occur during catarrhal or other inflammations of the pharynx or fauces, especially when these are attended by much irritation of the glottis and severe cough. The blood generally is seen in streaks in the viscid mucous expectoration. When the lower portion of the pharynx is affected, and when there are retchings as well as cough, the discharge of blood is occasionally more considerable; and it is then difficult to determine whether it proceed from the pharynx, or the œsophagus, or the stomach, or even from the bronchi or lungs; and whether it is merely an inflammatory exudation or a consequence of ulceration. These points can be determined only by the history of the case, by a careful examination of the sputa, and by a due consideration of all the phenomena. *Softening* of the internal coats of the pharynx, and especially of the mucous and sub-mucous tissues, is seen in typhoid, exanthematous and malignant fevers, and in scurvy and after the ingestion of caustic, alkaline or septic, or other poisons. — *Abscess* or suppuration of the pharynx has been already noticed when treating of inflammation (§ 18.). It may give rise to ulceration and to still more extensive and dangerous alterations of parts in the vicinity, as shown above; but *ulceration* is much more frequently produced by syphilitic infection (see VENEREAL DISEASES). Ulceration generally takes place in the posterior portion of the pharynx, although it has, in rare instances, attacked the anterior or latter portions and extended into the larynx or trachea.

56. (*c*) *Fibrous tumours* or *polypi* have been found in the pharynx, or implicating the upper region of it and the posterior nares; but they very rarely arise primarily from this portion of the alimentary tube. *Cancerous* or *carcinomatous* or *medullary formations* sometimes affect this part, but not so frequently as the œsophagus. In the cases of carcinoma of the pharynx which I have seen, the base of the tongue and the pillars of the fauces became implicated, and the canal or passage into the œsophagus narrowed, and ultimately so remarkably reduced as to render the conveyance of nourishment into the stomach most difficult or nearly impossible. The carcinomatous ulceration has in some instances been followed by fatal hæmorrhage before this change has supervened.

57. (*d*) *Foreign bodies* of various kinds, and especially the bones of fish or of other animals, may be fixed in the pharynx, or penetrate, partially or altogether, the parietes of the canal, and give rise to inflammation, abscess, &c. Foreign bodies of every possible kind may be swallowed or be attempted to be swallowed, and produce either immediate or more or less remote effects of a serious or dangerous nature, for which surgical as well as medical aid may be required — the former immediately, the latter subsequently. — Of

wounds of the pharynx it is not my province to speak.

58. iii. **Treatment** *of Organic lesions of the throat.*—*a. Enlargement and Induration* of the tonsils are generally the consequences of neglect of the slighter forms of tonsillitis, of repeated returns of the disease, or of the chronic remitting forms already mentioned, (§§ 9, 10.) especially when occurring in the scrofulous diathesis, and in delicate persons. For these states of disease numerous methods of cure have been employed. The scarifications and local means already noticed (§ 39. *et. seq.*) may be first tried; and if these fail, the measures about to be advised may be employed, and modified according to circumstances, whilst the general health should be promoted by change of air, and by a suitable diet. But, with the promotion of health and strength, the several depurating functions must be regulated and severally increased. Tonic infusions or decoctions with hydrochloric or nitro-hydrochloric acid, or with pyroligneous acid, or instead of acids, the alkalies and the iodide of potassium, or the chlorate of potass, may be severally prescribed. The local application, by means of a hair brush, of a weak tincture of iodine, or of a strong solution of the nitrate of silver, or of dilute nitric, or hydrochloric, or pyroligneous acid, has often been found of the greatest service, especially whilst the iodine ointment, or terebinthinate embrocations have been applied externally.

59. *b.* The *removal* of enlarged and indurated tonsils has been advised since the days of Celsus down to the present time. Some surgeons have employed ligatures to the enlarged tonsil, others have had recourse to excision. Unless the enlargement have resisted scarifications and the means already recommended, after a sufficient trial has been given, and unless the enlargement greatly impedes the voice, speech, and deglutition, I would not advise either of these operations to be performed. For, knowing that the functions of the tonsils are to secrete a lubricating fluid, for the superior orifice of the glottis, and for the epiglottis and pharynx, it necessarily follows that the extirpation of these organs deprives these parts of what is essentially requisite to the healthy discharge of their offices. Hence the throat becomes unpleasantly dry and husky. Voice and speech are thereby remarkably injured and are incapable of being exerted for any considerable time. These effects I have observed to follow in numerous cases where the officious interference of surgeons has removed these organs. I have not known an instance of a female who had had a good voice who did not entirely lose it after the extirpation of the tonsils; and a similar result has often followed the excision of the uvula close to the velum palati.

60. *c.* The treatment of organic lesions of the throat and tonsils consists chiefly of the early opening of abscesses or small collections of matter when these form, as stated above (§§ 42, 43.); of the employment of the local and constitutional means already advised when the tonsils remain enlarged and indurated; of the fumigations and washes, astringent, tonic, and antiseptic, when ulceration, softening, &c., affect any portion of the throat; and of the several means above directed, and the diet and regimen recommended for the asthenic and chronic forms, and for the usual consequences of guttural inflammations. In all cases, support of the constitutional powers, attention to the state of the bowels and kidneys, to the digestive functions generally, and to diet and change of air, are most important. Air, food, and water, are most influential both in producing and in removing affections of the throat, whether functional or structural; and upon a judicious attention to, and avoidance or selection of these, appropriately to the nature of each affection, the success of treatment will mainly depend.

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THRUSH.

THRUSH.—Synon.—*Aphthæ or Aphtha*, Αφθαι, Hipp., Gal. (from ἅπτω, I inflame); *Pustulæ Oris*, Haly Abbas;—*Ulcuscula Oris*, Auct.; — *Stomacace*, Ploucquet; — *Alphtha*, Sauvages; — *A. Infantilis*, Plenck; — *Aphthæ*, Vogel;—*Aphtæ*, Pinel;—*A. Lactantium*, Bateman;—*Cystisma Aphthosum*, *Typhus Aphthoides*, Young;—*Emphlysis Aphtha*, Good;—*Aphthes*, *Muguet*, Fr.; — *Schwämmchen*, *Mundschwammenchen*, *Mehlhund*, Germ.; — *Afte*, Ital.— *Thursh*.

Classif.—III. Class, I. Order. (*Author in Preface*).

1. Defin. — *Numerous white curd-like specks or exudations on the tongue and insides of the lips, gradually spreading to the interior of the cheeks and fauces; preceded and attended by fever or constitutional disturbance, and very often symptomatic of disorder of the digestive organs, or of structural disease.*

2. *Thrush*, or *Aphthæ*, was divided by Dr. M. Good into three varieties: — 1. *Aphtha Infantum*; 2. *A. Maligna*; 3. *A. Chronica*. The *first* and *second* differ chiefly in the degree of vital depression by which each is attended. The *third variety* is always symptomatic, generally of structural disease. The *first* has been considered as a primary or idiopathic affection by some writers, but this may be viewed as somewhat doubtful, for it is very generally preceded by disorder of the digestive functions, and by more or less constitutional disturbance; and hence it may be viewed as contingent upon, or as a peculiar manifestation of, such disorder. It has been often mistaken for, or confounded with, the erythematic, the pseudo-membranous, and the ulcerated forms of Stomatitis (*see that article*), from which it is quite distinct. In the true thrush there is neither pustulation nor ulceration, but an exudation, at numerous points, of a white, curd-like matter, enlarging and spreading more or less along the buccal, pharyngeal, and œsophageal mucous surface.

3. i. Causes.—This disease may attack all ages, but with a very different degree of frequency. It is most common in infants, especially those at the breast or only a few months of age. In these, particularly in the two first months of existence, it has been viewed as an idiopathic affection. However, this view is merely conventional, and may be entertained in respect of this affection with a considerable share of justice. M. Veron believed that this disorder may even affect the fœtus. I am not, however, aware whether or no it has been seen in any case at the time of birth. It is rarely observed in adults, and still more rarely in aged persons. When it occurs at a more advanced period than that of early childhood, it is generally symptomatic of, or at least complicated with, some visceral disease. It occurs most frequently in children of a feeble constitution and in those who breathe an impure air. The seasons have no very manifest influence in causing it. M. Valleix, however, considers it to be most prevalent in hot seasons. Van Swieten says that it is rarely met with in very cold and very warm climates, but apparently from insufficient evidence. M. Guersent remarks, that in temperate countries it is somewhat more frequent in cold and wet seasons, and when catarrhal affections are most prevalent. This seemed to be the correct opinion; but the crowded or ill-ventilated wards of lying-in, or children's hospitals, and even such wards, however well aired; low, humid, and close apartments and localities; insufficient, unwholesome, and inappropriate nourishment; and whatever impairs the vital powers, are the chief causes of this affection, especially in children. Hence it is frequently observed in those who are attempted to be brought up by hand, or who have sickly nurses with poor or unhealthy milk; in the children of ill-fed or drunken mothers, and in those who are suckled by nurses with inflamed and irritable nipples. Boerhaave attributed the affection to protracted suckling in many cases, and to the premature or improper use of purgatives. It does not appear to be infectious or propagated from one child to another, although it may be produced in more than one by the unhealthy state of the nurse's breast or milk.

4. ii. Symptoms.— According to M. Valleix, the thrush is very often preceded by erythema of the groins and the posterior and upper parts of the thighs, which may have existed several days before the affection of the mouth appears. This is certainly the case in many instances, and is an indication of irritation, or a disordered state, of the digestive mucous surface, the circulating fluids being also imperfectly elaborated, or containing excrementitious elements. At the commencement of the complaint, redness, dryness, and heat are perceived in the mouth, and the infant

evinces pain, fretfulness, or restlessness, or even disinclination to seize the nipple when applied to the breast of the nurse. At this time, dryness of the skin, frequency of pulse, and various other febrile phenomena are present. This may be called the *first* or *erythematic period* of the disease, and is almost identical with erythematic stomatitis — *Stomatitis erythematica.* (See Stomatitis, § 3. *et seq.*)

5. *A.* The *characteristic features* of the disease, the *eruptive* or *second stage*, is shown by whitish points or minute white specks in the surface of the inflamed membrane. These specks first appear on the point of the tongue and on the insides of the lips and cheeks. They soon increase in number, enlarge, the nearest uniting and forming irregular but thin small patches, which remain separate or distinct, are after a time detached, and again renewed. As long as these minute albuminous exudations continue distinct — *aphtha discreta*— the complaint is comparatively mild; but they are successively thrown off in thin flakes, the inflammation subsiding at periods varying from seven days to three or four weeks. In severer cases, however, the patches of albuminous exudation increase in size and thickness, unite or run into each other, forming one continuous coating; and extend over the tongue, fauces, and pharynx — *aphtha confluens.* In these cases, the cream-like albuminous exudation covers the greater part of the mouth and fauces, becomes daily thicker or deeper; and, when it is thrown off, the mucous surface, deprived of its epithelium, reproduces a new exudation, softer and more curd or cream-like than the former. The colour of this is at first white, but it becomes yellowish in the course of a few days, the child being more and more enfeebled and emaciated. The pulse is now quick, weak, and small, the stomach irritable, the bowels disordered, and emaciation increased. Subsequently vomitings occur, the matters ejected being mucous, curdy, and of a yellowish or greenish tint; and the substances taken into the stomach being hardly changed. Diarrhœa often supervenes, with extreme prostration; but death sometimes takes place before diarrhœa becomes apparent or at least urgent, owing to the severity of the gastric symptoms, to the impossibility of deglutition, and the rapidly progressive exhaustion. In these cases the surface of the œsophagus, stomach, and duodenum presents a similar appearance to that of the mouth and throat, the villous coat being covered by numerous dirty, greyish, or yellowish elevated specks or patches of exudation; and the villous and subvillous cellular tissue being injected, tumid, softened, and most readily torn or detached from the muscular coats. When diarrhœa takes place and becomes urgent, and especially if tormina, straining, or dysenteric symptoms occur, the aphthæ disappear, almost or altogether from the mouth, the vomitings frequently cease, and food is sometimes even taken and retained. But the evacuations are frequent, painful, mucuous or curdy, sometimes streaked with blood, or contain shreds of lymph or exudation, and are often offensive or emit an acid odour. Excoriations appear at the anus, the sphincter being irritable and constricted, and miliary pustules occasionally break out in different parts of the body. Although in these the duration of the disease is protracted, the ultimate result is not much more favourable than in the former class of cases.

6. *B. After death* the small and large intestines present the most marked indications of change; the appearances of these viscera, as well as the symptoms during life, showing that the disease which had originated in the mouth had traversed the œsophagus, stomach, and the whole intestinal canal, the upper portions of this canal having been more or less restored to a healthy state after the lower portions had become affected. The bowels are covered interiorly by a pulpy exudation, more marked in some places than in others, and of a yellowish grey or brown tint. The villous and subvillous tissues are tumid, softened, and very lacerable, the epithelium being thickened and opaque. Whether the morbid exudation be external to, or beneath, the epithelium has been a subject of discussion. According to my own observation, it appears to take place beneath this covering in some situations, especially in the mouth and at the anus, where the epithelium is more fully developed, and above or externally to it in other situations, and to be attended by a thickening or a detachment of the epithelium in most places.

7. *C. The nature of Aphthæ* has been discussed by several recent writers referred to hereafter. Aphtha is so very closely allied to the plastic forms of stomatitis and cynanche, as to warrant the opinion that it is merely a modification of these, resulting from the age, constitution, strength, habit of body, &c., of the patient, in connection with the extrinsic causes and influences producing it. According to the ages, habit of body, states of the circulating fluids, and to various external influences, aphtha, the allied affection, named muguet or blanchet by French pathologists, plastic stomatitis, pseudo-membranous cynanche or quinsy (the diphtherite of Brettoneau), and croup, are merely varieties of one disease marked by different grades of acuteness, by the sensible qualities of the morbid exudation which chiefly characterise them, and by the parts on which this exudation appears, and to which they severally are most prone to extend. Whilst aphtha, muguet, and plastic stomatitis, on the one hand, most frequently occur in infants at the breast, oftenest arise from intrinsic causes, and most frequently extend to the alimentary canal; pseudo-membranous cynanche and croup, on the other hand, more frequently affect older infants and children, oftenest proceed from extrinsic causes and influences, and most frequently extend to the respiratory passages.

8. *Muguet* or *Blanchet*, which several writers have considered as a distinct affection from aphtha, and from plastic stomatitis and cynanche, is merely a modification of these; or it holds an intermediate place, approaching very closely to aphtha in its sensible characters, and in its marked disposition to extend along the alimentary canal; and presenting appearances allied to the plastic or pseudo-membranous forms of stomatitis and cynanche, especially as respects the morbid exudation, as seen in the mouth, or in other parts of the digestive tube. Thus the variety of these affections, termed *Muguet* by French pathologists, may be placed between aphtha and plastic stomatitis, with which, as well as with pseudo-membranous cynanche and with croup, it presents very intimate relations.

9. All the affections now named are to be viewed not merely as simple inflammations of the mucuous surface or membrane in which they are seated or to which they extend, but also as special or peculiar in their states or characters, particularly in the superficial nature of the inflammatory action; in the plastic condition of the morbid exudation, varying, however in consistence, cohesion, colour, &c., in each affection; in the manner in which the epithelium of the affected surface is involved in the exudation; and in the marked disposition they all possess to extend along the mucous surfaces, without materially affecting subjacent tissues. These characteristics, especially the disposition to extend continuously, and the states of the morbid exudation, may be ascribed to impaired, or originally deficient vital power, allowing the extension of the morbid action; to an imperfect power of limitation or vital resistance; and to the condition of the circulating fluids, these fluids abounding most probably in albuminous and imperfectly assimilated elements and materials, and being deficient in hæmatosine or duly developed blood-globules.

10. *D.* Recent microscopic observers have detected in the cream-like exudations of aphtha, especially in the advanced and most unfavourable states of the malady, when vital power is most depressed, *parasitic vegetable productions* of the most minute and lowest forms. These parasitic formations appear during life in these states of the disease, or immediately after death; and when they form during life they multiply remarkably after dissolution. They can be viewed only as the evolution of the lowest grades of organization in the morbid secretions which take place from surfaces during the most depressed conditions of vitality, and upon the departure of the vital manifestations from the several textures of the body; their multiplication taking place with remarkable rapidity, especially on the more exposed surfaces. They belong to the class *Cryptogamia*, and are low forms of *algæ* and *fungi*. These, which appear on the mucous surface of the mouth and digestive canal, are chiefly the following:—1st. *Oidium albicans* (Berg, Vogel, Robin); *Aphtophyte* (Gruby); the cryptogamia of aphtha and diphtheritis.—2ndly. *Sarcina ventriculi* of Goodsir; the *Merismopædia ventriculi* of Robin.—3rdly. The *Leptothrix buccalis* of Robin; alga of the mouth.—4thly. The *Cryptococcus cerevisiæ*, Kutzing; the *Torula cerevisiæ* of authors; the yeast-plant. Of the opinions lately entertained as to the formation of these and other parasites some notice will be taken when those which form in Tinea are mentioned.

11. II. Treatment:—The means commonly resorted to by the ancients for this disease were in many respects the same as those employed in the present day.—*A.* Celsus advised alum in honey as a local application for aphtha; and Avicenna subsequently, and Lindt and Stoll in modern times, recommended the same. Honey, myrrh, crocus, and various detergents were prescribed by Paulus Ægineta; and aromatic tinctures with honey, by Riedlin. Borax and other detergents were employed, in mucilage, by Ackermann, in honey by Gooch, with cinchona, in honey by Loefler, and in syrup of roses by Starke. Camphor was used locally in honey by Avicenna, and the syrup of mulberries by Riedlin. The pomegranate fruit and bark were also employed locally by Actuarius; the sulphate of zinc was similarly prescribed by Reil and Herz. Emetics were recommended by Hufeland: and when the sulphate of zinc is used locally with honey or syrup of roses, a portion of it is sometimes swallowed and acts as an emetic. Absorbents were mainly relied on by Harris and Chalmers; and the mineral acids, chiefly the hydrochloric, by Grant and many others.

12. *B.* The *treatment* of aphtha should be *Hygeienic* and *medicinal*—local as well as constitutional or general. Unless *hygeienic* measures be judiciously prescribed, the local and general medicinal treatment will generally be inefficacious. The *causes* which have produced the complaint ought to be removed as completely as possible, and the patient placed in a dry, temperate, and open situation in a well aired apartment. Change of air is in most cases more or less beneficial. The nourishment should be prescribed with care; and if the child be still suckling, the milk and health of the nurse ought to be objects of particular attention. The age of the milk, the habits and functions of the nurse, and the state of her nipples, require examination. If the nurse have suckled long, or if she be intemperate, delicate, unhealthy, or cachectic; if the catamenia have been present, or if the nipples are sore, another nurse should be obtained. If the child is being or about to be weaned, it may be necessary to defer the weaning for some time, if the nurse be healthy; but if the complaint be then or at any other time attributable to the state of the milk, another nurse must be immediately sought for. If this intention cannot be accomplished, or if the child have been weaned, the disease having been occasioned by the change of nourishment, or by improper food, ass-milk or goat's milk, warm from the animal, should be given in quantity or states of dilution, which the peculiarities of the case, or the effects produced, will suggest.

13. *C.* The medicinal treatment, local and constitutional, must depend chiefly on the causes of the affection, on the age, strength, and circumstances of the patient, and on the history and complications of the case. In most instances of this disease, local as well as constitutional remedies are required, the former to correct or remove the local affection, the latter to improve the strength and the digestive and nutritive functions. Washes and lotions for the mouth, to be used by means of a piece of sponge firmly attached to a stick or whalebone, when the child is too young to rinse the mouth with them, are generally required; but the selection of these should depend much on the peculiarities of the case. The biborate of soda conjoined with honey is most commonly used. When the biborate is freely employed it readily cleans the mouth, separates the morbid exudation, and destroys the parasitic production that often appears; but if much of it be swallowed, it irritates the stomach and bowels. If these be already in a state of irritation, the local means which are least likely to increase that irritation or most likely to remove it ought to be prescribed. In such cases weak solutions of chloride of lime, or chlorinated soda, or chloride of zinc, may be used as now advised; or a solution of the nitrate of silver, applied by a pencil or sponge, as already recommended; or mucilage, or honey, or syrup of roses containing diluted sulphurous, or muriatic acid, may be em-

ployed in a similar manner. The chief objection to these latter is, that when they are swallowed in any considerable quantity they often occasion severe griping pains, or increase existing disorder of the bowels. Dilute pyroligneous acid with minute doses of creasote may be tried in the same way as the preceding; or lemon juice may be substituted for the acid. Dr. Jenner has recently recommended the solution of a dram of the sulphite of soda in an ounce of water, as a wash for the mouth when the parasitic formations are developed. Many years ago I generally directed at the Infirmary for children a confection composed of powdered liquorice root, honey, and a small proportion (about ¼ to ⅛) of spirits of turpentine; and my experience has convinced me of its superiority over other means in the larger number of cases.

14. Various other washes or gargles for the mouth have been advised and are very commonly used, especially solutions of borax with tincture of myrrh, honey, or syrup of roses; or the solution of alum in the infusion of roses, with tincture of krameria or catechu and a small quantity of tincture of opium. If the bowels become much relaxed, the cretaceous mixtures, with the compound tincture of camphor and the tincture of krameria or catechu, and aromatic confection; the warm bath or semicupium, salt or mustard being added to the water, are commonly of service. If the powers of life are much depressed, warm stimulants should be added to whatever other means may be required. Of these the most beneficial are the carbonate and aromatic spirit of ammonia, camphor, capsicum, tincture of cinnamon, or of arnica, or of cascarilla, &c.; and one or more of these may be selected. If the bowels be constipated, magnesia and sulphur, rendered palatable with ginger and liquorice powder, may be prescribed, either with or without rhubarb, according to circumstances.

15. In all cases of thrush, the *hygeienic* treatment ought to receive especial attention. The food of the child should be selected with care, and the effects of each particular article of diet carefully observed, in respect of the functions of digestion and defecation. The other means already noticed under this head (§ 12.) should receive no less attention; for the use of detergent, astringent, or antiseptic applications, as above advised, ought never to supersede hygeienic measures, the restorative, tonic, and febrifuge remedies, and even the more active stimulants, which are often indicated in both the more simple and the complicated forms of this disease.

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TINEA.—Synon.—*Tinea capitis*. Αχωρ, Græc. *Favus*, Lat.—*Porrigo*, Celsus, Pliny, Willan. —*Tinea*, Sennert, Sagar, Sauvages, Cullen. —*Phlysis porrigo*, Young.—*Ecpyesis porrigo*, Good.—*Crusta lactea*, *Impetigo*, Auct.—*Kleien kleiengrind*, Germ.—*Teigne*, *Gourme*, Fr.—*Tetter*, *Scall*, *Scalled-head*, *Ringworm*.

Classif.—See Skin—*Classification of its Diseases*.

1. Definit.—*A specific chronic disease affecting chiefly the hair follicles, where specific parasitic plants are developed, and which are capable of communicating the disease to parts susceptible of the infection.*

2. M. Bosquillon supposes that the term *Tinea* was used for the first time by Etienne, of Antioch, who, in 1127, translated the works of Haly Habbas. It was afterwards adopted by Guy de Chauliac, and long subsequently employed by Ambrose Paré. But from the earliest use of the term, the greatest diversity of opinion existed as to the varieties or forms which the disease presented. Guy de Chauliac recognised five forms of Tinea, which term was used synonymously with *porrigo*; viz, *T. favosa*, *ficosa*, *amedosa*, *uberosa*, and *lupinosa*. Ambrose Paré described three varieties; *T. porriginosa*, *ficosa*, and *corrodans*. Much more recently Alibert admitted five species of the disease; namely, the *mucous*, *furfuraceous*, *amiantaceous*, *granular*, and *favous*. Willan described six species under the genus *Porrigo*; *larvalis*, *furfuracea*, *lupinosa*, *scutulata*, *decalvans* and *favosa*. It is obvious that those as well as other writers comprised under the generic term Tinea or Porrigo several eruptions of the scalp which actually were varieties of different diseases. Thus the *Porrigo larvalis* of Willan corresponds with the *Achor mucosus* of Alibert, a variety of *impetigo*. The *Porrigo favosa* is a true *impetigo* of the scalp, and is the same as the *granular tinea* of Alibert. The *Porrigo furfuracea* of Willan, is the *Tinea furfuracea* of Alibert, and is merely *Pityriasis capitis*: the *Tinea amiantacea* of this latter writer being only a more chronic and severe form of the same affection. Thus several varieties of *Eczema*, *Im-*

petigo, and *Pityriasis*, have been arranged under *Tinea*, or its synonyme *Porrigo*.

3. It has been recently shown by Bazin, and further illustrated by Dr. Jenner, that several affections of the scalp are connected with the development of parasitic microscopic plants. These affections are obstinate, contagious, seated chiefly in the hair follicles, have a tendency to spread in circles, and hence have been popularly called ringworm. M. Bazin and Dr. Jenner have included under the genus *Tinea* those affections which are attended, kept up, or produced by the development of minute parasitic plants or spores; namely, *Tinea favosa*, *T. tonsurans*, *T. decalvans*, and *T. sycosa*. — Of these four species, three only will be considered at this place, the fourth, or *Tinea sycosa* — the *Mentagra* of Willan and Bateman, the *Sycosis* of numerous writers — has been described under this latter appellation. (*See* Art. Sycosis).

4. i. Description. — *A. Tinea favosa*, *Porrigo favosa* of Willan and Bateman; *Favus* of Dr. A. T. Thompson, Simon and others. This disease most frequently appears on the hairy scalp, but sometimes on other parts of the body. It is characterised by dry, thick yellow crusts, which are, when small, circular, depressed in their centres, and somewhat cup-shaped. A hair is generally seen passing through the centre of each crust. Some of the crusts are generally very small, whilst others have a diameter of one third of an inch, or even upwards. The larger appear in many instances as if formed in concentric rings, alternately yellow and brown, and have an irregular shape or outline, still, however, indicating their origin from distinct centres. The large, irregularly shaped crusts are pitted on the surface, and, from their resemblance—often however very slight—to the divided surface of a piece of honeycomb, the disease has been named favus. The margins of the larger crusts are considerably above the level of the surface; whilst the centres seem somewhat sunk into the substance of the cutis. Upon carefully detaching the crusts from the surface a distinct layer of epithelium is found beneath them, whilst a careful examination of the smaller crusts shows a layer of epithelium covering them. The crusts of Tinea favosa are remarkable for their thickness, dryness, brittleness and depressed centres. It is not a pustular disease, but it is sometimes consecutive upon eczema, impetigo, chronic lichen and herpes circinatus; and pustules are occasionally or sometimes formed subsequently to Tinea favosa, owing to the irritation produced by the morbid exudation, and by scratching.

5. The hair, even at an early period of the disease, may be easily pulled out from the centre of each little crust. It subsequently falls out of the diseased parts, and permanent baldness of those parts results. When the disease is developed, or any considerable extent of surface is affected, a peculiar offensive odour, which has been variously described, is generally perceived. This was noticed by John of Gaddesden*, in his *Rosa Anglica*, where he gives the following definition of Tinea —"Tinea est scabies capitis, cum squamis, crustis, pilorum evulsione, colore et odore fœdo, et aspectu abominabili."

6. The parasitic plant, detected by the aid of the microscope, is different in species, and in the precise situation occupied by it in the several species of the disease. In *Tinea favosa*, as described by Gruby, Bazin, Robin and Jenner, the cryptogamic parasite is the *Achorion Schönleinii*. "This plant has mycelium, sporule-bearing branches, and sporules. The sporules are round or oval, and their diameter varies, according to Gruby, from 0·003mm. to 0·01mm. The vegetable growth is first perceptible between the layers of epithelium, just at the orifice of the hair follicle; from this point it may spread downwards between the hair and its capsule, and upwards around and in the substance even of the hair." (Jenner.)

7. *B. Tinea tonsurans*—*Porrigo scutulata* of Willan, Bateman, and A. T. Thomson; *Herpes tonsurans* of Cazenave and *Trichinosis furfuracea* by Wilson—is often mistaken for *Herpes circinatus* of the scalp, with which, however, it is sometimes associated. It is characterised by pallor of the affected part, and by decolorisation and brittleness of the hairs. Thin, white, powdery scales surround the bases of the hairs, and cover the skin between them. The affected hairs somewhat resemble "tow," and are remarkable for their bent and twisted shape, and resemblance to the fibres of hemp in colour and appearance. They are sometimes so brittle, that every hair in the affected spot is broken off close to the surface. The diseased patches are generally circular. Crusts form on the patches of Tinea tonsurans only when, from neglect, from scratching, or from the application of irritants, they become inflamed. The parasite in this species of the disease is the *Trichophyton tonsurans*, "and is composed of spores only; the spores, however, are occasionally somewhat elongated and arranged in a linear series. They are round or oval, and their diameter varies from 0·003mm. to 0.01mm. The primary seat of this parasite is the root of the hair. Subsequently it extends up into the substance of the hair, and even outwards, according to Bazin, on to the skin between the hairs." (Jenner).—The spores may be at first confined to the hair follicle. But Bazin and Robin have described and delineated them between the fibres of the hair, which they had split up.

8. *C. Tinea decalvans* — *Porrigo decalvens* of Willan and Bateman; *Vitiligo of the Scalp* of Cazenave—is characterised by the falling out of the hair rapidly, from one or more circular spots, leaving a smooth bald surface, without crusts, scales, or eruption of any kind. When the bald surface is large, it becomes more irregularly shaped, with scalloped edges, and a tendency to preserve the circular form. The disease may spread over the greater part or the whole of the scalp.

9. In *Tinea decalvans* the parasitic formation is the *Microsporon Audouini*. "This plant is formed of branched filaments, on which the spores are developed. The spores are very small, from 0.001mm. to 0.005mm. The seat of the growth is the outside of the hair, and it forms a sort of sheath around the hair, from the surface of the skin, upwards, from 1mm. to 3mm. Gruby first described this plant, and its relation to Tinea de-

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* He admits the contagious nature of the disease, and supposes it to be caused by depraved humours and bad food, and by transmission from the parents or nurse.

calvans; and Robin says he can confirm the accuracy of Gruby's description."—(Jenner.)

10. *D.* For *Tinea sycosa*, see Art. Sycosis. These *four species* of Tinea are especially *characterised* as follows: Tinea favosa is remarkable for its crusts;—Tinea tonsurans for the discoloration and brittleness of the hair;—Tinea decalvans from baldness not preceded nor attended by an eruption;—and Tinea sycosa from inflammation, tenderness, hardness, and suppuration of the hair follicles.

12. ii. Causes.—It has not been decidedly shown whether or no the parasitic formations detected in these species of tinea, are the actual causes of them, or whether they are formed in the course of the disease. Those who espouse the former alternative, believe that the spores of these parasitic plants are given off, float in the air, and infect those who are exposed to them. Still they admit that these spores require for their growth a peculiar nidus. Dr. Jenner contends that, as all persons who mix with children affected with tinea do not receive the disease, a soil favourable to the growth of the spores previously exists, so that when a spore is conveyed to that soil it is developed and forms other spores, and so spreads and propagates. Remak applied the crusts of favus to his arm, and having removed them after a time, his skin appeared perfectly healthy; and it was not until a fortnight after that his arm had become diseased. Still this experiment does not prove, that the spores contained in the crusts produced the infection, but that the morbid secretion forming the crusts infected the parts to which it was applied, and that the hair follicles, thus becoming diseased, furnished the secretion in which the parasites were developed; and hence the experiment of Remak favours the latter alternative rather than the former; viz. that, the morbid secretions of the crusts having infected the hair follicles, parasitic cryptogamic formations were developed in the secretion lodged between the layers of epithelium and between the hair follicles and the roots and fibres of the hair. Those who believe that the conveyance of the spores from the developed disease to a soil suited to their growth, admit that the soil exists, and consists of an already morbid state of the hair follicles, caused by debility, scrofula, neglect of cleanliness; and that many persons, especially those thus predisposed, "have in their hair follicles a secretion suited to be the nidus of this plant." But this admission is in truth what I contend for; namely, that the disease, owing either to the strumous diathesis, to constitutional or local debility, to uncleanliness, to the lodgment of foul matter, or to the contact of contagious secretions, supervenes in the hair follicles, and the morbid secretion in these follicles produces, according to its especial nature or character, a parasitic formation peculiar to each species of the disease. Thus the parasite is consecutive of disease of the follicle, and not the agent by which the disease is propagated. Dr. Jenner almost admits this whilst he contends for the agency of the spores, by remarking that "the patient suffering from Tinea comes under our care for the perceptible disease, and will be well contented if we can cure him of that; but it would be better if we could also destroy the susceptibility to the disease,—if we could bring the hair follicles into a state in which they no longer secrete a nidus in which the plant can grow." The truth appears to be, that in this disease, as well as in others, where a morbid secretion is produced in states of great general or local debility, and where these secretions remain long in contact with the surface producing it, and protected in these situations, parasitic formations of low grades of vitality and development take place, the morbid secretions forming the material of growth, and the vitality emanating from the diseased part, imparting to these materials the organisation which they present.

13. iii. Treatment.—General and local debility, a scrofulous diathesis, and want of cleanliness predisposing to, if not of themselves producing, the disease, contagion being an efficient or exciting cause in many if not in all instances, the contagious agent being, moreover, either the spores of the parasitic plants noticed above, or the secretion of the affected parts, the *indications of cure* are quite apparent. These are—1st. to strictly observe general and local cleanliness;—2nd. to improve the state of the constitution;—and 3rd. to remove the local affection. These intentions may be fulfilled contemporaneously. But in many cases, especially of the *second* and *third species*, none of the predisposing causes just mentioned may exist; there may be neither debility, nor the scrofulous diathesis, nor want of cleanliness, and yet the disease is present. Contagion or infection may be inferred without sufficient proof, even although the parasitic formations are detected by the aid of the microscope; for it may as reasonably be concluded, that the disease has occurred sporadically, owing to debility or other morbid condition of the hair follicles, the secretion of these follicles giving origin to the parasitic formations in the manner above stated. (§ 6. *et seq.*) *A.* In most instances, especially where the conditions, often favouring the several species of the disease, are present, frequent ablutions and poultices, in order to remove the crusts; tonics and alteratives, aided by the usual Hygeienic measures, change of air, exercise and suitable diet, are requisite. But, at the same time, *local means* are indispensable, especially such as may restore the hair follicles to a healthy state, and destroy the parasitic formations, to which more than due importance has been imputed since their discovery by microscopic observers. These means are remarkably numerous, but most of them are only occasionally efficacious, comparatively few being even generally successful.

14. *a.* Whilst constitutional treatment is being employed, the local means most to be relied upon should be strenuously continued. The hair ought to be cut close; the crusts of favus softened and removed by linseed or bread and water poultices, and by ablutions with strong soft soap, and the scalp covered by an oiled silk cap. These preliminary measures are always necessary. After these, the local remedies most to be confided in, should be prescribed.—But, before I notice the substances that have been more recently recommended, I shall enumerate those which had previously been prescribed, and more or less confided in. These latter have generally been employed in the form of *ointments*, of *lotions*, or *washes*, or *plasters*. The *first* of these, whatever may be the active ingredient, should be

washed off by means of soap and water, or any alkaline or detergent lotion, after having been applied for some hours, and immediately afterwards renewed; for ointments often become more or less rancid and irritant when they have been long applied. Most of the fluid applications or lotions, whether solutions, dilutions, decoctions, or infusions, require to be applied for some time to the affected part, by means of lint, especially if the crusts have not been entirely removed, and the hair of the diseased follicles is still remaining. *Washes* may be selected with the double intention of cleansing the surface and curing the disease; this latter object being attained either by destroying the parasitic plant or by removing the morbid condition producing the parasite, or by this combined action. *Plasters* may be employed, after the hair has been cut off close to the surface, with the object either of removing the diseased hair, or of curing the affection, or of fulfilling both intentions.

15. *b.* The *ointments* prescribed for this complaint after the crusts have been removed, have often failed. Those containing *mercury* in some form or other, although advised by very eminent physicians, have not only frequently failed, but have sometimes been injurious, especially when their effects have not been carefully watched. Ointments containing calomel are praised by Hildebrandt and others. Those with the white precipitate, or with the nitrate, have been employed by Purmann, Vogel, Lentin, Murray, and Rino. *Sulphur* ointment, or the balsam of sulphur, in the form of an ointment, has been recommended by Roland, Hamilton, Barton, and Alibert. Ointments containing the *sulphate of copper* have been prescribed by Thomann, Desault, Duncan, and Starke; that with *muriate of barytes*, by Hufeland,—with *cantharides*, by Wendt,—with common *soot*, by Pelargus, Thomann, and Niemann, — with *conium*, by Quarin, Stoerck, Murray, Stoeller, and Hufeland,—with *tar*, by Van der Haar,—and with *empyreumatic oil*, by Zacutus Lusitanus and Rudolphi. The *unguentum Jasseri*, which consists of the sulphate of zinc and sulphur, is praised by Schack. It was formerly in great repute in Germany, for the cure of this affection. Ointments with the *balsam of Peru* and *tincture of Lytta*, have very often been prescribed by the author for the second and third species of the disease, with success.

16. *c. Lotions* and *washes* have been as generally used in Tinea as ointments. Dilutions of the *acids* have been advised by many,—of the *nitric acid*, by Colla and Tommasini,—of *muriatic acid*, by Thilenius, Plenk and Brinckmann,—of *sulphuric acid*, by Agricola and others;—and the pyroligneous *acetic acid*, either alone or with creosote, by myself. Solutions of the *bi-chloride of mercury*, either in dilute alcohol, or in water with the muriate of ammonia, have been employed by Zacutus Lusitanus, Bell, Duncan, and others, but they may be injurious. Solutions of *borax* either in distilled water, or in diluted acetic acid and tincture of myrrh, have been prescribed by the author. Besides the above, solutions of the *nitrate of silver*, of the sub-carbonates of the *alkalies*, of the sulphate of *copper*, of the sulphate of *zinc*, of the sulphate of *iron*, of the *sulphuret of potass*, and of the *arseniate of potass*, have been severally employed by numerous authorities; whilst decoctions, infusions, &c. of *tobacco* and of various narcotic plants, have been advised by many writers. The *Ledum palustre* was used by Linnæus, and the *Tussilago farfara* by Meyer and Hufeland.

17. The use of *tan-water*, as either a lotion or wash, after the removal of the crusts of favus is favourably mentioned by Weaver. I have in similar forms and circumstances employed strong *tar-water* with complete success.

18. Other substances have been prescribed for this complaint either in the form of ointment or in a fluid state, as a lotion or wash, as the peculiarities of the case suggested. Of these the most important are *arsenic* and *tobacco*. My own observation has proved that these may be most dangerous when applied to a large surface after the crusts of favus have been removed, especially when incautiously used in a fluid state, or when ointments containing either have been too long applied or too frequently renewed. Justamond witnessed a case in which the use of a decoction of tobacco was fatal; and I have seen an instance in which arsenic applied to the scalp after the removal of the crusts of favus very nearly produced a fatal result. *Tartar emetic* has been advised by Blizard, and employed in the form of ointment and lotion; but it may be also injurious, if not carefully watched, and it is by no means of great service at any period of the disease.

19. *d. Plasters* of common *pitch*, or *Burgundy pitch*, have been employed with the object of removing the hair from the diseased follicles, and of restoring the follicles to a healthy state. *Ammoniacum*, made into a plaster with acetic acid, and applied after the crusts have been removed, has been prescribed with the same intentions as the pitch. Tar ointment, or tar mixed with melted suet, has been similarly used. *Tar* applied simply over the affected part, after the crusts and diseased hair have been detached, and covered by oiled silk, very seldom fails of success, especially if tar or pitch pills be given internally during the treatment.

20. More recently the preparations of *iodine* have been frequently prescribed, both in this disease and in several others of those which I have arranged under the Order, *Dermatites contagiosæ* (see Art. Skin § 76.) As early as 1825, Mr. Morson prepared for me an *iodide of sulphur*, which I prescribed in the form of ointment (from ℈j to ʒj in an ℥j) in cases of Tinea and psora, chiefly at the Infirmary for Children. About the same time and subsequently I frequently employed the tincture of iodine somewhat diluted, or the iodurated solution of the *iodide of potash*. These preparations were generally successful, especially if the preliminary part of the treatment was duly attended to (§§ 13, 14.) I have also employed various combinations of camphor, turpentine, and soap liniment after the removal of the incrustations; or the former of these with lime-water.

21. *B.* When favus is seated on the trunk or extremities, it may be easily cured by these means or even by alkaline, or sulphurous baths, or by frequent ablution with strong soft soap after the incrustations are removed by poultices. But when it is seated in the scalp, then most of the means above noticed may fail, or at least require

a protracted use, if the diseased hair be not removed. *Evulsion of the hair* was long ago directed by ASTRUC, ACREL, FISCHER, VAN DER HAAR, MORISON, LAMOTTE, SEDILLOT and PLUMBE; and more recently by the Messrs. MAHON of Paris, who facilitated and accelerated this intention by a depilatory powder, the composition of which they kept secret. The method formerly employed of extirpating diseased hair was by applying straps of plaister, variously prepared with pitch, ammoniacum, or other gums, after the removal of the incrustations, and by removing these straps forcibly after a day or two. Dr. WILLIS has justly remarked that any plan of treatment which combines the removal of the hair by gentle means, or when it has been loosened at its roots, with undeviating attention to cleanliness for about two months will be found to cure favus.

22. Very recently, the local treatment of Tinea has very satisfactorily been illustrated by Dr. JENNER, and in such a manner as to deserve particular notice and adoption. Professor GRAHAM had suggested the use of *sulphurous acid* and the *sulphite of soda* for the destruction of parasitic formations. Dr. JENNER adopted the suggestion in the treatment of Tinea favosa; and it may be inferred that the means he has employed will be serviceable also in the other species of tinea. A solution of sulphurous acid is prepared, by passing a stream of the gas through water until the latter is saturated. Of this solution two ounces may be added to six ounces, to make a lotion, which may be used by means of lint, and frequently applied and kept wet for the removal of the crusts, and subsequently applied to keep the surface clean. Afterwards zinc ointment may be prescribed to heal the surface left raw or sore by the previous application. I have seen great benefit obtained from washing the scalp occasionally, or frequently, with tar-water, or solutions of creasote, or with terebinthinate lotions. When the disease is seated on the trunk or extremities, the saturated solution of sulphurous acid may be abundantly added to a tepid bath, immersion being continued for about half an hour, and repeated after intervals of two or three days: a very few repetitions of the acid bath appears to remove the disease. This treatment deserves a trial in the second, third, and fourth species of tinea, as well as in several other chronic eruptions, and especially in all those which I have classed under the ORDER *Dermatites contagiosæ* (See art. SKIN, § 76. *et seq.*).

23. *C.* Most of the means above noticed may be employed for the *second and third species of tinea*, due attention being paid to the states of the hair and hair-follicles; and the more stimulating applications, as the balsam of Peru, tincture of lytta, the essential oils, &c. being prescribed in pomades or ointments, after a due trial has been made of the sulphurous acid. After the acid has destroyed the parasite, these applications will be of service in restoring the functions of the hair follicles. (See art. HAIR.)

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TONGUE — DISEASES OF THE. — (Γλῶσσα, γλῶττα.—*Lingua*, Lat.—*Langue*, Fr.—*Zunge*, Ger. *Lingua*, Ital.—*Lengua*, Sp.)

1. Those slighter affections of the tongue which are symptomatic of either constitutional or visceral diseases, and which furnish more or less important indications of the seat, nature, and issue of disease, have been passed in review when treating of the symptoms and signs furnished by this organ in the article SYMPTOMATOLOGY. (See § 101., *et seq.*)

2. I. NEURALGIA OF THE TONGUE. — SYNON. *Glossalgia* (from γλῶσσα and ἀλγέω, I pain). *Tic Douloureux of the Tongue.*

CLASSIF. — See NEURALGIC AFFECTIONS.

3. *A.* Neuralgia of the tongue is not of frequent occurrence. I have seen only a few cases; and in these the pain was, without an exception, limited to one or other side of the organ. The pain presents nearly all the characteristics of neuralgia. It is sudden in its accession, most violent, often contracting the organ to the side affected, sometimes causing an abundant flow of saliva, and inducing sympathetically, more or less, contortion of the face. Its continuance may be momentary, its cessation being as sudden as its occurrence; or it may be more protracted, with more or less remission and violent exacerbation. The pain sometimes resembles the passage of a sharp instrument, or of a hot needle from the side of the base to the apex. The cases which I have seen were unattended by neuralgia of any other part, and I have viewed them as indicative of irritation either at the origin, or in the course of, the nerves supplying the side of the tongue affected; and as a not improbable precursor either of paralysis of the tongue, or of hemiplegia, or of apoplexy.

4. *B. The treatment* should be based upon the inferred states of the general and cerebral circula-

tion, as respects either congestion, capillary action, or inflammation. If the neuralgic pain recur frequently, or prove obstinate or protracted, notwithstanding a due recourse to local depletions, especially cupping on the nape of the neck, or over the mastoid processes, when general or local plethora or increased action exists; to purgatives and deobstruants, or to tonics, stimulants and antispasmodics, with or without anodynes, when neither congestion nor inflammatory action is inferred, it will often be of service to pass a seton into the nape of the neck, and to preserve a free discharge from it. In some cases, especially when increased action or congestion exists, the shower bath or the cold effusion on the head, whilst the feet are kept warm, or plunged in hot water, ought to be cautiously employed. The treatment in all respects should be the same as recommended in the article on Neuralgic Affections. (See § 79. *et seq.*)

5. II. Paralysis of the Tongue.—Classif. —See art. Palsy.

6. i. *Palsy* of the Tongue *is characterised by limited or impaired movements of the organ, and imperfect utterance, or entire loss of speech.* The loss of the power of motion of the tongue is generally unattended by the loss of sensation. The sense of taste is often not affected (Scarpa and myself) Paralysis of motion when primarily affecting the tongue is rarely so complete as to entirely prevent articulation. But after a stroke of apoplexy, or in connection with hemiplegia or other paralytic states, the motions of the tongue are often so constrained or impaired as to affect articulation, more or less. When articulated sounds are altogether prevented, then the nerves of the tongue are not alone affected, but those also of the pharynx are more or less implicated, deglutition being also impaired, or very difficult. Paralysis of the tongue is most commonly observed at an advanced period of paralysis of a more or less general form, or after repeated attacks, especially of apoplexy, and is a very unfavourable sign. When thus appearing or associated, it is always attended by impaired or lost articulation, and is followed by difficult or lost deglutition; the patient, however, being often carried off by an apoplectic attack before this latter symptom occurs. Palsy of the tongue, in a more or less complete form, rarely precedes apoplexy or hemiplegia; but when it thus appears primarily, or before the occurrence of an apoplectic or hemiplegic seizure, it is always a very dangerous symptom, and most rarely exists long without a severe or fatal attack supervening. When it thus occurs primarily, it may or may not be accompanied by impaired or altogether lost deglutition. I have seen several cases of primary paralysis of the tongue, with complete loss of articulation, the first and most complete of these with Mr. Winstone. In these no other sign of disease was observed, and in all I inferred that severe or fatal apoplexy would occur in a short time; this result took place, and was rapidly followed by dissolution. In a case recently attended by Dr. N. Grant and myself, the paralysis of the tongue and pharynx disappeared upon an attack of gout in the feet. The slighter states of impaired movements of the tongue are, however, no infrequent precursors of apoplexy or palsy, and generally somewhat impair utterance or articulation.

7. ii. *The treatment* of palsy of the tongue is in many respects the same as described in the articles Apoplexy and Paralysis, and depends entirely upon the inferred pathological conditions—1st, of parts near the origins, or in the course of the lingual and pharyngeal nerves; 2nd, of the blood-vessels and blood; 3rd, of the organic nervous system; and 4th, of the excreting viscera. If a gouty diathesis be inferred; or if gout have been previously experienced, sinapisms should be applied to the lower extremities; *Masticatories* and *Errhines* have been much recommended by Hautesierck and Lange; a *seton* or open *blisters* on the neck, by Helwig, &c., and active purgatives by Riedlin; but these are generally in use.

8. III. Inflammation of the Tongue. Syn. —*Glossitis* (from γλῶσσα, the tongue).

Classif. — III. Class; I. Order. (*See Author, in Preface*).

9. Definit.—*Pain, great swelling and redness of the tongue, more frequently towards its base, and sometimes confined to one side of the organ, with more or less febrile action, the character of which varies with the cause and nature of the local disease.*

10. *Idiopathic and sthenic glossitis* is sometimes a very severe and even a dangerous disease. It is not, however, often met with in practice, although the tongue is much exposed to the usual causes of inflammation. J. P. Frank saw but one case during a practice of twenty-five years, and during forty-five years he treated only seven cases. I have seen only four cases of this form of glossitis in thirty-five years. Of these, two terminated in suppuration; one only having thus terminated in the seven cases seen by Frank. The four which occurred in my practice either were limited to one side of the organ, or affected one side chiefly. The cases which were followed by abscess were limited to one side; and the inflammation in all the cases was chiefly seated in the thick part of the tongue. This immunity from the more usual sthenic form of inflammation may be ascribed partly to the muscular structure of, and partly to the abundant supply of nerves possessed by this organ.

11. i. Acute Glossitis. — *Sthenically acute glossitis.*—This disease is readily recognised, as it comes directly before the senses of the physician. *It is characterised by redness, swelling, hardness: an acrid, stinging sense of heat, or a burning pain of the tongue, with either great dryness of the mouth, or a profuse flow of saliva, and the usual symptoms of inflammatory fever.* In proportion to the swelling are the functions of the organ impaired, and the voice, speech and deglutition affected; the two latter being generally either nearly or altogether abolished in the most severe cases. Sometimes the tongue is swollen to such a size as to press upon the glottis, or rather to prevent the rising of the epiglottis, and to fill up the isthmus faucium and mouth, and threaten suffocation. In other cases, the swollen and inflamed tongue is protruded from the mouth. This, however, is oftener the case in the sympathetic glossitis proceeding from cynanche (see Throat, *Inflammation of*), and from the excessive use of mercury, when the simultaneous affection of the tonsils, parotids, and parts in the vicinity, and the consequent tumefaction of these, press the tongue outwards.

12. *A.* In some cases the attack is sudden; and in the most severe cases the tumefaction and the threatened suffocation are such as to place the patient's life in imminent danger. The surface of the tongue is generally covered by a thick mucous coating, or by an exudation of lymph. At the commencement of the disease the sense of taste is very acute, owing to the excited state of the nerves and increased vascularity of the papillæ; but, as the disease proceeds, taste is abolished, owing perhaps to the pressure experienced by the nervous fibrillæ from the turgid vessels, and fluid effused in the structure of the organ, and partly to the thick mucus or lymph covering the inflamed surface. To these are added unquenchable thirst, great anxiety and restlessness, head-ache, turgescence of the countenance, swelling and tenderness about the throat, and beneath the maxilla, watering of the eyes; sometimes anxious, pale or saddened expression of countenance, quickened circulation, costive bowels and high-coloured urine.

13. The *course* and *termination* of the disease are the same as of other inflammations. The malady usually proceeds as above, in a more or less severe form, and generally increases until the third, fifth, or seventh day, when it either subsides gradually under treatment, or terminates in resolution with critical phenomena, particularly profuse perspiration, hypostatic urine, or a copious discharge of saliva, or bleeding from the nose, or accession of the catamenia. If a favourable change does not take place at these periods, the disease may terminate in suppuration or in sphacelation; or it may occasion suffocation or apoplexy, neither suppuration nor gangrene having taken place, but these unfavourable results very rarely occur, unless the disease has been neglected.

14. *C. Abscess* seldom follows glossitis, owing to the muscular structure of the organ. I have seen only two cases in my practice, in which abscess occurred; and after a free opening was made the parts readily healed. Cases are recorded by EDERMAJER, FRANK, and others of this termination of the disease. Owing to the exudation of lymph into the substance of the organ, considerable hardness and enlargement sometimes remain long after the acute state of disease has been subdued. HILDENBRAND supposes that this change may at last terminate in scirrhus or carcinoma; and in this opinion he appears to be supported by the observations of LOEFLER and ZEIGLER. I believe, however, that cancer very rarely or never supervenes upon sthenic forms of inflammation; malignant diseases of the tongue, commencing in a slow and insidious form, and independently of antecedent acute disease. When acute glossitis goes on to suppuration, very serious consequences may result from neglect of this state. When the disease comes under treatment previously to the commencement of suppuration, this result may be prevented; or if it be inevitable, danger will be avoided, by a judicious and prompt method of cure; unless it take place in sympathetic glossitis, or in persons of a cachectic habit of body, or in cases caused by animal poisons taken into the mouth, or by the stings or bites of poisonous insects or reptiles.

15. ii. *Asthenic Acute Glossitis.*—*A.* Inflammation of an acute asthenic character may take place either in a person whose constitution has been exhausted and his blood more or less altered, or in the advanced stage of a malignant febrile malady, as in exanthematous and pestilential diseases, or by the application of such animal poisons or deleterious matters as will be noticed in the sequel, to the tongue or mouth. This state of the disease, especially when occurring from these last-named causes, generally appears suddenly, and proceeds rapidly with great violence. The pain and tumefaction are very great, the inflamed parts being livid, or dark-red, or brown, and the accompanying fever being characterised by vital depression, by a very quick weak or irritable pulse, and by signs of progressive contamination of the circulating fluids. Asthenic acute glossitis is seldom seen in a primary and uncomplicated form. It is most frequently met with as a complication of scarlet fever, of small pox, of erysipelas, and of pestilential maladies. When it occurs primarily, it may generally be inferred that some foul or poisonous substance has caused the attack. But whether appearing primarily or in the course of another malady, its diffusive nature is manifest. It often extends to the fauces, tonsils, pharynx, surrounding cellular tissue and neck, more especially when it is caused by animal or other poisons, or by the sting of an insect.

16. *B. The course and termination* of this form of the disease are generally rapid and unfavourable, unless very prompt and judicious means be employed. When it is caused by the contact or inoculation of poisonous matters, the local changes vary with the cause. These changes may consist of tumefaction owing to the exudation of a dirty lymph or serum, or the affected parts may be livid, or otherwise discoloured, and more or less softtened; or they may nearly approach a gangrenous state. In some cases the inoculated poison may so affect the organic nervous and vascular systems, and the blood, as to occasion death in a short time, the changes found in the tongue and adjoining parts being insufficient to account for this result.

17. iii. THE CAUSES of acute idiopathic glossitis are chiefly poisonous, chemical and mechanical agents. Animal poisons applied to the tongue, or animal matter in a state of disease or of decomposition, or the blood or the discharge from foul sores or malignant ulcers, the bites of insects, &c., produce the more severe and asthenic form of the disease. The incautious or accidental mastication of acrid and irritating substances, especially such as are poisonous, as briony or wild vine, the mandragora, the arum and other poisonous plants have produced glossitis. I saw a case of the diffuse and asthenic form of the malady caused by monkshood accidentally masticated. Caustics, acids and acrid chemical compounds, cauteries; hot and highly seasoned articles of diet and stimulating drinks; mechanical injuries, as wounds, punctures, or bites during mastication or epileptic paroxysms, operations on the teeth, or for ranula; burns or scalds, the irritation produced by irregular or carious teeth, and the local action of irritating or stimulating substances introduced into the mouth during coma, have severally occasioned glossitis. I saw a case following the introduction of mustard into the mouth to produce vomiting in a case of poisoning by opium. The disease has sometimes been ascribed to the more

common causes of inflammation, as exposure to cold in any form, draught of cold water or the use of ice, suppression of the perspiration or of accustomed discharges. SCHNEIDEMANTEL states, that he saw glossitis follow exposure to cold; STARCK from suppression of the menses, and hæmorrhoids; WENDT from suppressed perspiration of the feet; and DELATOUR from sudden suppression of epistaxis.

18. The above have been viewed as the chief *efficient causes* of this malady; but several of these may be considered as incapable of producing it, without the concurrence of others, either *favouring* or reinforcing them. The chief or most influential *pre-disposing* causes are, disorders of the prima via and digestive organs generally, especially those characterised by the accumulation of morbid secretions and mucous sordes; the gouty, rheumatic and scrofulous diatheses, and inflammatory affections of neighbouring parts. VON MERTENS, KEMME, LOEFFLER and others have too strongly insisted upon the occasional relations of these diseases to glossitis. In rare instances the disease has been said to have appeared immediately upon the subsidence of other inflammations. Thus FRANK observed it after an attack of hepatitis; Dr. ELLIOTSON saw it after bronchitis; but such occurrences may be viewed as hardly connected, or as mere contingencies.

19. iv. SYMPTOMATIC AND COMPLICATED GLOSSITIS.—Inflammation may attack the tongue consecutively upon inflammation of adjoining parts, as of the tonsils, fauces, gums, and pharynx. This form of the disease not infrequently occurs from excessive mercurial action of the salivary glands, which in some constitutions may be induced by a very small dose of any *mercurial*. (See art. POISONS, § 568. *et seq.*) This unpleasant result is sometimes induced by exposure to cold, or to currents of cold air about the head and neck, during or soon after the use of mercurials, or from the suppression of the salivary discharge by these causes. When the tongue is affected from excessive mercurial action, or suppression of the salivary flux, there is generally much more tumefaction than actual inflammation of the organ; the inflammatory action even when present, possessing much less of the true sthenic or phlogistic character than when the disease appears in an idiopathic form.

20. Glossitis also occurs symptomatically, and forms an important complication, in *scarlet fever* and in *small-pox*. REIL observed it in several cases of an epidemic fever which occurred in the north of Germany near the termination of the last century (*Fieberlehre*, ii. p. 370.); and VAN SWIETEN, DELAMALLE, LOUIS, MARJOLIN, and myself, have seen it supervene in the progress of malignant fevers. When thus complicated, glossitis is generally asthenic, diffusive, or spreading, the parts adjoining being more or less implicated, and the danger of the disease thereby greatly increased. I have seen this complication also in ERYSIPELAS, and have adverted to it when treating of that disease.

21 v. SUPERFICIAL AND PARTIAL GLOSSITIS.—This is generally a more chronic form of the disease than any of the foregoing. It consists chiefly of an inflammatory state of the villous surface of the tongue, and is much more common than inflammation of the substance of the organ. This is very frequent in young children, consisting generally in an extension of inflammation either to or from the adjoining parts. It is thus very often met with in aphthous affections (see THRUSH), in inflammation of the mouth and gums (see STOMATITIS), and Cynanche maligna (see SCARLET FEVER and THROAT, &c.). In this partial and associated form of glossitis the edges of the tongue are chiefly affected, but the whole of its surface may also partake more or less of disease, and the organ may also be swollen. The inflammation may be moreover of a specific kind — not only of the kinds just mentioned, but *syphilitic*, with or without ulceration. This state of the disease is even occasionally met with in infants, and has been caused by the affected nipples of nurses. This partial form of glossitis may also proceed from mercurial action. It is attended in this case with more than ordinary loss of the vital cohesion of structure; the edges and sides of the tongue have an inflamed, swollen, flabby, and unhealthy appearance, and retain the impressions of the teeth, against which they are forcibly pressed by the tumefaction of the organ. This state of partial glossitis sometimes gives rise to fungous excrescences of a soft, flabby, and vascular character, shooting between the teeth, and bleeding on the slightest irritation.

22. Partial or superficial glossitis is much more frequently seen in the course of scarlet fever, small pox, continued fevers, &c., than the form of the disease noticed above (§ 20.) as complicating these maladies in rare instances. It often occurs, also, in the inflammatory affections of the throat, as an extension of these affections (see arts. STOMATITIS and THROAT); and not unfrequently it is symptomatic of disorder of the prima via, particularly of the stomach and liver, arising from the accumulation of morbid secretions. Owing chiefly to this cause, it is sometimes also observed accompanying several acute cutaneous eruptions, as urticaria, &c.

23. vi. CHRONIC SUPERFICIAL GLOSSITIS.—This form may be confined chiefly to the sides or edges of the tongue, or may extend over the whole surface. In either case I have seen it as the chief lesion or affection, whilst it has been more frequently associated with a similar affection of the gums, fauces, and pharynx. It is a common complication in *scurvy*, and then it is generally removed in due time by the means recommended for that disease. But in other circumstances it is a most obstinate, and often serious, but a rare malady. In some cases, the redness and peculiar raw appearance of the tongue have apparently extended not only to the fauces and pharynx, but also to the œsophagus and, in some degree, to the villous surface of the stomach. When the disease is confined chiefly to the sides or edges of the tongue, the irritation caused by carious or irregular teeth may have occasioned or prolonged it. But when it is more general, the digestive viscera are in fault, and owing to the nature of their disorder, the affection of the tongue varies in severity and duration. In a few cases of this disease which I have seen, the redness, pain, heat and soreness of the tongue, were very much complained of; and they had been of considerable or long duration before I saw them. The gums were also red, retracted from the teeth; and the fauces and pharynx were more or less affected. The surface of the tongue

was deprived of its papillæ, was raw and inflamed throughout, acutely sensitive, but the organ was not much swollen, although it was the part more especially affected. Of five or six cases of this disease that I have treated, two went from under my observation after having been some time under treatment without much apparent benefit. The others were also obstinate, but recovery or relief followed the means about to be noticed. (§ 36. *et seq.*). One of the cases was imputed to the use of iodide of potassium in large doses. In all, the extreme tenderness of the tongue and mouth, the difficulty of taking solid food, or of masticating any food, the pain on deglutition, the disorder of all the digestive functions, and the occasional irritability of the stomach and bowels, the torpor of the liver, the state of the urinary discharges, &c., had occasioned more or less emaciation, with other indications of cachexia, and shown the relations of the disease. This form of glossitis appeared to have been, in all the cases, symptomatic of prolonged or neglected disease of the digestive organs, more especially of the villous surface of the digestive canal.

24. vii. The Prognosis of glossitis may be inferred from what has been stated respecting its forms and terminations.—*a.* When the disease has been produced by an animal poison; when the attack is sudden and violent, and the swelling is great; when the constitutional disturbance is very considerable and the pulse is quick and weak, the disease is then attended by great, or even extreme danger. The risk is generally greater in the *asthenic* than in *sthenic* cases: but, even in the latter, when the tongue is greatly swollen, or much discoloured, and the suffocative symptoms urgent, the danger is then very considerable. In the milder idiopathic forms, especially when the treatment is judicious and prompt, the prognosis is favourable. When the disease is *complicated* with any of the forms of cynanche, or is attended by much swelling, pain, and tenderness about the throat and angles of the maxilla, the danger is considerable; as the extension of inflammation either from or to the tongue indicates both a severe form of disease, and a faulty state of the vital power and habit of body of the patient.

25. *b.* The termination in *abscess*, although an unpleasant occurrence, is not generally attended by danger: indeed, in persons not otherwise diseased the constitutional symptoms not being very urgent, no risk may be apprehended, particularly if the abscess be limited in extent or confined chiefly to one side of the tongue. If suppuration, however, take place in an unhealthy subject, and be attended by a very quick, irritable pulse, by depression of the vital energies, by delirium towards night, coma, followed by a fatal issue, should be expected. Sphacelus and gangrene rarely occur, but recovery never takes place when they appear in this organ, as a termination of either primary or complicated glossitis.

26. *c. Partial* glossitis and *chronic* glossitis, especially when affecting aged persons, are often very obstinate diseases; the latter especially. When the partial glossitis is caused by carious or irregular teeth, or has often occurred, or has gone on to ulceration, it is very difficult of cure. The ulcerations may become indolent, or be followed by hardening, enlargement, or even by scirrhus and carcinoma. The tongue may thus present a very dangerous state, which, although at first local, may, in its advanced stages and malignant form, assume a constitutional and fatal character. *Chronic* glossitis is always a protracted and unfavourable form of disease. In all the cases I have seen, it formed only a part of very complicated states of disease, but a very distressing part, requiring both discrimination and perseverance in both the local and constitutional treatment.

27. viii. Treatment.—*A.* Of Acute Glossitis. — The treatment of this disease should be modified according to the causes producing it. When it has arisen from causes the operation of which still continue, as the irritation occasioned by irregular or carious teeth, foreign bodies, &c., these should be removed as soon as possible. When it has originated in causes which are not depressing to the vital energies, the means of cure should be very different, or even opposite to those which are required when it is caused by poisonous agents. In the former circumstances the disease presents a *sthenic* character, in the latter an *asthenic* form, both locally and constitutionally.

28. (*a.*) *Sthenic Glossitis.* In this form, the vital energies are not impaired, although vascular action be locally and generally excited. Hence vascular depletions are promptly required, with an activity proportionate to the severity of the disease. Authors, however, differ as to the situation from which the blood should be abstracted. Many recommend the application of a number of leeches, or scarifications and cupping, about the throat, angles of the jaws and neck, after venesection in the arm: others advise blood-letting from the raninal veins, or from the feet; whilst some prefer the application of leeches to the inflamed tongue. The determination of this matter may be of some consequence, and it may be even next in importance to the amount of blood which should be taken away. In these matters the physician should be guided by the causes and the severity of the disease. But in acute sthenic glossitis, blood-letting, whether general or local, or both, will not of itself cure the disease, unless in its less severe forms; and in those which are severe, the raninal vessels cannot generally be reached.

29. The very slight advantage derived from vascular depletion in this disease as usually performed, has been long known to physicians, and has led them to the adoption of other measures of a decisive character, and productive of a locally depleting effect, namely of *incisions* made into the substance of the inflamed organ. This practice seems to have been first resorted to by Job Meckren in 1656, and it has been generally followed ever since. Delamalle, Naumberg, Stoeller, J. P. Frank, Arnemann, Hildenbrand, Schneider, Delatour, Van Dekeere, Marjolin, and others, have prescribed it in many cases. Louis states that *incisions* have failed only in those cases where they have been too superficial; and he therefore advises that they should be deep, and consist of from two to four, made longitudinally near the edges of the organ—one or two on each side of the median line, from the base to near the point. A copious discharge of blood should be promoted from the incisions by emollient applications, by the steam of warm water or medicated vapours, by suitable gargles

and washes, &c., which will at the same time favour the termination in resolution. In the cases which I have seen, incisions were successfully employed. In two cases, suppuration had advanced before I was consulted, but incisions were directed and were equally beneficial.

30. Other antiphlogistic means are also required in this form of the disease, especially cooling purgatives and diaphoretics. Drastic purgatives are often necessary at the commencement of the treatment, and although Broussais and his followers —the master and disciples of a now obsolete school—have inveighed against them, experience has demonstrated their utility. Galen, Van Swieten, and many others, have recommended them. Their operation should be assisted by active purgative injections. The excessive thirst accompanying the disease may be calmed by a solution of cream of tartar, with a little nitre in tamarind water. If deglutition be prevented by the swollen state of the tongue, the urgency of this symptom may be moderated by tepid or warm bathing, by emollient lavements, and by cooling and emollient fomentations to the throat, and by applications to the tongue itself. Injections of a similar nature should be thrown into the mouth, which the patient ought to be directed to gargle or wash frequently with emollient infusions and decoctions. Speranza advises an infusion of digitalis for this purpose. (*Annali Univ. de Med.* Jan. 1829.) Marjolin recommends gargles and lotions with diluted vegetable acids. A solution of the biborate of soda and bitartrate of potash, or of the former alone, in the decoction of marshmallows, or in linseed tea, is one of the best gargles or washes in this disease. I have employed it with benefit in this form of glossitis, as well as in the other forms which I have designated partial and superficial. Linctuses, consisting of mucilages or honey, or syrup of roses, and containing either the muriate of ammonia or the nitrate of potash, are also of considerable benefit, both in these states of the disease and in the partial and superficial forms.

31. In addition to the above means, external and internal *derivatives* or *revulsants* have been resorted to, as *blisters* or terebinthinate *embrocations* applied beneath the lower jaw, or to the nape of the neck, and repeated; *sinapisms* to the lower extremities, stimulating pediluvia and manuluvia, drastic *purgatives*, and irritating *enemata*, &c. M. Dupont advised, after incisions or scarifications of the tongue, an active *emetic*; and I believe the practice to be judicious. Amongst other means, substances calculated to excite the action of the salivary glands have been recommended by Blancard and Marcus. Mercurial preparations may be prescribed for this purpose when the disease is not of a mercurial origin, but their action is not sufficiently rapid nor certain. Speranza advised lotions of infusion of digitalis.

32. (*b.*) Asthenic Glossitis, especially when it becomes diffusive, or has been induced by the contact or inoculation of an animal or any other poison, often assumes a very violent and dangerous form, the lividity and swelling of the organ being great, the local and constitutional symptoms indicating a powerful sedative influence on the system. Consequently a different treatment from that advised above is required, and that treatment should be promptly decided on, and energetically carried out. Still the severity and the cause of the disease should decide the adoption and the selection of the means. Vascular depletions, as usually practised, are not required in this form of the disease, and are rarely productive of any benefit. Yet *incisions* into the tongue (§ 29.) may even here be practised with advantage. The cases of Stoeller prove their advantage in this state of the disease. Indeed, incisions may be more advantageous in this than in any other form of the disease, by allowing the discharge of the poisoned exuded fluids, causing the swelling and contamination of the organ. After they have been made, the tongue and mouth should be afterwards often washed with a decoction of cinchona, with either of the mineral acids, and camphor, or with a strong infusion of green tea, or of arnica, or with strong tar-water; or these ought to be injected into the mouth, when they cannot be otherwise taken into it; and full doses of the preparations of cinchona, of serpentaria, or of arnica with camphor, or with hydrochloric acid and hydrochloric ether, or with ammonia and its preparations, should be often administered, in such forms and vehicles and in such a manner as circumstances will suggest or require. If an animal poison has occasioned the disease, fluids containing the turpentines, or creasote, or the chlorides, &c , ought to be introduced into the mouth, and the tonics and stimulants assiduously administered, conjoined with alkalies, or with chlorides, or with other medicines already mentioned, both by the mouth and in enemata.

33. (*c.*) *Glossitis, symptomatic* of, or *complicated* with, eruptive or malignant fevers, is generally of an asthenic character. Blood-letting is injurious in these cases, beyond the local discharge proceeding from the incisions, which also may be necessary, and which should then be made, when the tumefaction and pain, or sensation of suffocation, are urgent. Whilst the primary or the special disease ought to receive due attention, and be treated appropriately to its form and stage, the local complication, according as it may present more or less of the characters appertaining to either of the states above described should be treated conformably with the recommendations already offered.

34. When the disease has gone on to *suppuration*, then incisions into the adjoining parts, and a free opening into the part in which the matter is either forming or is collected, should not be neglected. If there be little or no swelling unless that produced by the collected matter, a free opening into it will generally suffice. But when the matter is formed in the asthenic form of the malady, or after inoculation or contact of a poison, incision or scarifications of parts adjoining may be required.

35. The severe states of glossitis caused by mercury have been likewise treated by incisions by Plenck, Delamalle, Frisse, Schneider, and others. Louis advises blood-letting, and agrees with Plenck and others, in the active administration of purgatives, drastic enemata, sudorifics, diuretics, astringent and cooling washes, and change to a dry and healthy atmosphere. Emetics have also been recommended, and I have prescribed washes with tar-water, with creasote, with the chlorides, and with several other substances, the affection continuing notwithstanding for a considerable time in some cases. (See art. Poisons, § 590. *et seq.* and Stomatitis, § 20. *et seq.*)

36. *B. Partial and Superficial Glossitis.*—Most of the local means already advised may be prescribed in this state of the disease; but in all cases due reference should be had to the predisposing and exciting causes, and to the states of the digestive, the assimilating, and of the depurating functions, and of the constitutional powers. The lotions, linctuses, &c., washes or gargles, mentioned above (§ 32.), or those prescribed in the article STOMATITIS (§ 14. *et seq.*), or solutions of either of the mineral salts, as the sulphate of zinc, the nitrate of silver, &c., may be severally employed as circumstances will suggest. These last, or the dilute mineral acids in tonic or astringent decoctions, and used as washes or gargles, are most appropriate when ulceration is present. In most of the cases which come under the present category, the treatment and means advised under the heads STOMATITIS and THRUSH are quite appropriate.

37. *C. Chronic Glossitis*, whether it be limited to the sides or edges of the tongue, or whether it be more general and superficial, is always a most obstinate disease, and is often merely a severe local manifestation of a very general and serious malady, or at least of a protracted disease of the digestive organs. Hence, in addition to the local means already recommended—to the use of vegetable, of saline, and mineral astringents and refrigerants, of emollients and demulcents, &c.—general and constitutional remedies, directed especially to the restoration of the digestive, assimilative, and depurative functions, or to the removal of whatever lesion or disease which may be inferred to exist in any of the organs devoted to the discharge of these functions, should be prescribed, and their effects closely watched and aided by a suitable diet, regimen, and change of air. Cachectic symptoms should be combated; and when the diet, mode of living, air, water, or residence of the patient appear to have originated or concurred in producing the malady, these especially should all or severally be ameliorated, or altogether changed.

38. The principles now stated and developed above, as well as in other places in this work, must be guides to the inexperienced in the treatment of the diverse forms and complications of glossitis; for it is impossible to lay down rules, or to furnish illustrations or explanations of such rules, as will be altogether appropriate to the diverse cases which may occur in practice. In such cases, as in those of other diseases, the physician must think and decide for himself, and, by thus habituating himself, he will ultimately more certainly arrive at correct practical conclusions.

IV. ORGANIC LESIONS OF THE TONGUE.

CLASSIF.—IV. CLASS, I. ORDER (*Author, in Preface*).

39. The structural alterations of the tongue are consequences either of inflammation, or of unhealthy or cachectic states of the constitution, or of chronic disorders of the digestive organs. Inflammations, either primarily or consecutively affecting the tongue, are rarely of any considerable duration, without changing more or less the structure of the organ; still they cannot be viewed in their earlier stages especially as falling within the category of structural lesions. Cachectic states of the constitution may variously alter the organisation of a part or organ, independently of inflammatory action, by either impairing, increasing, or otherwise altering the nutrition of that part, or by changing its cohesion, consistence, bulk, &c.; and prolonged disorder of the digestive organs, may sympathetically occasion similar effects on this part Organic lesions of this organ may, moreover, be produced by specific poisons or infectants.

40. i. ULCERATION OF THE TONGUE.—This lesion is frequently a consequence of partial or chronic glossitis, especially when limited to the sides, edges, or point of the tongue. It is often also a result of STOMATITIS and THRUSH; and of exanthematous and continued FEVERS, more especially of SCARLET FEVER and SMALL-POX. It frequently complicates SCURVY, and is often caused by the prolonged irritation of irregular or carious teeth. These antecedents are sufficiently indicative of the nature and treatment of the lesion. But the ulceration may be of a *specific nature*—and, it may be, *primarily* or *consecutively* or *secondarily specific*: as such it falls within the category of VENEREAL AFFECTIONS. Irrespective of these states of ulceration, there are others which not unfrequently are subjects of interest and concern to the physician—which cannot be imputed to these affections, and which require both a local and constitutional treatment.

When ulceration of the sides of the tongue is the result of prolonged irritation of irregular or carious teeth, both the nature and the treatment of it is obvious. As a consequence of scarlet fever, small-pox, and fever, the ulceration generally heals with the progress of convalescence. In rare instances, however, it becomes obstinate and chronic, requiring the application of strong solutions of the nitrate of silver, or the bichloride of mercury, of the tincture of iodine, &c. These ulcerations are seldom on the dorsum or middle superior surface of the organ; but, when they are thus situated, the constitutional disorder is then chiefly the cause, unless some local disorder of the surrounding parts have complicated and increased the affection. One of the most difficult cases of ulceration in this situation occurred in a case of typhoid fever; and was manifestly caused by the patient having, in the course of his delirium, taken a tongue scraper and forcibly removed the long dark fur covering the tongue; this fur evidently tending to protect the surface of the organ during the advanced stages of the fever.

41. Ulceration of the tongue may, however, take place without very manifest antecedent inflammatory action—at least without any severe or prolonged state of this action; and without any evidence of the state of the opposite teeth being its cause. The conditions of the digestive organs, especially of the stomach and collatitious viscera, or of the system generally, are, in most of these cases, the chief assignable causes; especially when the ulceration does not present either specific or malignant features. In some instances, even when these features may be expected, or are about to be developed, they may not be clearly manifested; for the ulceration may be either indolent, chronic, and variously characterised; and yet it may be difficult to state with certainty its cause, nature, or probable issue; the antecedents, concomitants, or history of the case being the chief guides. An ulcer in the side of the tongue, when caused by the teeth, may be cured with difficulty, even after the

cause is removed; and when it has followed protracted disorder of the digestive organs, or a scorbutic attack, it is not readily healed in many cases, after the disorder of these organs, or after a general cachexia, is either removed or greatly ameliorated, especially in aged persons. The dread of consecutive malignancy, or cancerous degeneration, always suggests itself; and, although such a result may not take place, we know that it often has occurred in such cases; or that the cancerous nature of the ulceration does not always distinctly declare itself at first.

42. ii. Cancer of the Tongue is not infrequent.—*A.* Dr. Walshe states that out of 8,289 fatal cases of cancer reported in the Paris registers in 1836, it was primarily or mainly seated in this organ. Scirrhus is its usual form, passing into ulcerations; but fungous excrescences sometimes appear, or exhibit the encephaloid character. It may attack any part of the tongue, especially the sides. I have seen three cases where it affected one side chiefly of the thick part or base of the tongue, extending to the isthmus of the fauces and even to the pharynx, occasioning remarkable dysphagia and its usual symptoms. It may commence as a small, somewhat knotty, and irregular tumour, generally seated in the anterior part of the organ, midway between the raphæ and the edge, or rarely extending beyond the middle line. It sometimes appears as a small excrescence. In very rare cases the cancerous matter is deposited in erectile tumours. Simple ulcers of a chronic or indolent nature may become cancerous; but instances of this occurrence are comparatively rare. In all cases, when the surface ulcerates, the glands become affected in the usual way. Distant organs are not frequently implicated. There is generally an aching sensation in the affected part and vicinity, with occasional sharp or darting pains towards the ear or throat. Pain and difficulty in speaking, masticating, and swallowing are always present, and increase with the progress of the disease, until these functions can no longer be performed. Incessant sputation is always present, and is most distressing. The cancerous cachexia and emaciation are always very remarkable. According to Mr. Travers strong males, upwards of forty years of age, are the most frequent subjects; but the disease is not rarely observed in much younger persons and in females.

43. *B. The Diagnosis* of cancer linguæ is sometimes difficult. The history and antecedents of the case should be duly considered. Cancer may be mistaken for *simple induration* of a part or side of the tongue, — an affection noticed by Ruysch and Percival, and most frequently seated in the base of the organ. This induration may depend upon tubercular deposits, and be attended by ulceration; but it is not apparently malignant, although it may possibly become so. Mr. Travers has described a *globular tumour* seated deeply in the tongue, which is characterised by an unyielding and uniform surface. Both these forms of lesion are best *treated* with tonics and alkalies conjoined with the iodide of potassium. The *fissured and dyspeptic ulcer* may bear a near resemblance to cancer, but it has not the hard basis of the latter, is often in the middle line, the rest of the tongue being often chapped or fissured. It is frequently complicated with psoriasis. *Syphilitic ulcers* are not easily distinguished from cancer linguæ. They are generally larger, have less marked and less circumscribed hardness of their margins: their discharge is less abundant, and they want the firm everted edge and sprouting edge of the latter. The history of the case should be strictly ascertained. "Dr. Warren describes an *enlargement of mucous glands* occurring on the side of the tongue, with a red fungous appearance, but differing from cancer in being sensitive, not painful, and unattended by real ulceration or thickening of the organ. *Hypertrophy of the mucous membrane* sometimes gives rise to irregular fissured elevations on the surface." *Erectile tumours* are known by their pulsation; but they become seats of cancerous deposits.

44. *C. The Treatment* of cancer of the tongue is palliative only in most cases. As the disease often primarily attacks this organ, the removal of it by surgical operations may be attempted before the glands in the vicinity become affected. Successful cases of this kind have been published by Mr. J. M. Arnott and others (*see the Modern Works on Surgery.*).

45. iii. Hemorrhage from the Tongue rarely occurs unless from accidents or operations, or in the far advanced stages of diseases especially affecting the crasis of the blood and the vital cohesion of the tissues. In these latter circumstances it is chiefly met with in some extreme cases of mercurial affection of the tongue, and not infrequently in yellow or hæmagastric pestilence, and in scurvy. In these maladies the blood often exudes from the surfaces of the tongue and gums more or less copiously. J. P. Frank notices a case of the latter disease in which the hemorrhage was so abundant from the tongue as to prove fatal. For these occurrences, as well as for others of a similar nature, the most appropriate *treatment* is the local application of spirits of turpentine, by means of lint or sponges, whilst the same medicine is taken by the mouth, in doses suited to the peculiarities and urgency of the case. The other means advised, when treating of *Passive* and other forms of Hemorrhage (see § 40. *et seq.*), may be employed if this fail.

46. iv. Induration of the Tongue is rarely met with unless in connection with tumour (§ 43.), or some degree of enlargement. It has, however, been noticed by Ruysch and Percival. It is occasionally seen in some degree in cases of syphilitic contamination. For such, the *treatment* should consist of the means advised for Venereal Cachexia. In other circumstances the alkalies with iodide of potassium, or the iodide of mercury, or the bichloride of mercury, with conium, may be prescribed.

47. v. Enlargement of the Tongue, often to a very remarkable degree.—*Hypertrophy and Elongation* have been described by several writers.—*A.* The enlargement has been generally so great as to cause the protrusion of the organ two or three, or even four, inches beyond the lips, the thickness and the breadth of the tongue being also greatly increased. I had frequent occasion to see a very remarkable case of this kind many years ago in a female. The instances of it adduced by Zacchias, Bartholinus, Camper, Trioen, Poilreux, Arnemann, Scaliger, Sandifort, Portal, and others, and

very recently by Messrs. Humphry, Hodoson, and Teale, as well as those described by the writers about to be noticed, present a remarkable similarity as to the appearance and nature of the enlarged organ. This lesion is well illustrated (by plates) and described by Mr. Humphry in the work referred to. The structure of the organ was not altered otherwise than hypertrophied. This disease is quite different from the tumefaction of the organ produced by inflammation or by excessive mercurial action; as it is permanent when not restrained by surgical treatment, and is not occasioned by the causes just mentioned. In the case which I saw the disease commenced in childhood, and had continued without change up to the period when I examined it, when the subject of it was upwards of 40 years of age.

48. *B. The Treatment* of this lesion is entirely surgical, and has been successfully conducted by 1st. Pressure; 2nd. Ligature; 3d. Incisions; and 4th. Amputation. The treatment by *pressure* has been employed successfully by Lassus (in two cases), Louis, Ruhbaum, Clanny, Freteau, Crosse, and Teale. *Ligatures* were employed by Inolis, Bierkin, Van der Haar, Mirault, Siebold, Edhold, Cooper, Wells, Liston, and Hodgson. *Incisions* were practised by Zacutus Lusitanus and Schneider. *Amputation* was resorted to by Pamard, Ficker, Klein, Percy, Harris (in two cases), Nevermann, Leber, Newman, Mussey, Pimpernell, Syme, and Humphry. The result was fatal in Siebold's, Liston's, and Syme's cases. *Pressure* would therefore appear to be the least dangerous mode of treatment.

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TREMOR.—Synon.—*Τρομός*, Gr. *Tremor*, Lat. *Synclonus Tremor*, Good.—*Tromos*, Swediaur.—*Zittern*, Germ.—*Tremblement*, Fr. *Trembling*.

Classif.—4. *Class*, 3 *Order* (Good)—I. Class; III. Order (*Author, in Preface*).

Definit.—*An involuntary, rapid, and feeble oscillation or agitation of some part of the body, or of the whole body, appearing primarily and without fever.*

1. Tremor has attracted the attention of the oldest writers on medicine. It has been noticed by Hippocrates, Celsus, Aretæus, and Galen. Aëtius and Paulus Ægineta have devoted chapters to the consideration and treatment of it; and many modern writers have taken a more comprehensive view of its morbid relations, its symptomatic forms, and of the means of cure.

2. I. Description.—Tremor is very frequently a sympathetic and symptomatic affection. It is, however, sometimes a primary or idiopathic disorder, or one which can be assigned only to the state of the nervous system, or of the nerves supplying the part affected, either at their origins or in their course. The *character* or *form* of tremor varies much in different cases, and with the causes which produce it. Thus it may be merely a *slight* but *quick oscillation*, or a more marked and *rapid* movement, or *to-and-fro motion*; or it may amount to a *violent agitation*. It may present either of these features, and be also a *rotatory* or a *vertical motion*, especially when the head, eyes, lower jaw, or limbs are affected, and according to the muscles which are acted upon. It may, moreover, be only *temporary*, or of short or uncertain duration; or it may be *remittent*, or *intermittent*, or continue a very *long* time, or the *whole of life*, without apparently shortening the length of life. It may, in any of these, be either *general* or *partial*, as respects the frame.

It may be a manifest and an important disease, or part of disease; or the patient may not evince any other disorder. In the latter case it may be viewed as idiopathic, or as constituting the complaint; in the former it is generally only a symptom. Although, when symptomatic especially, it varies its character, not merely as stated above, but sometimes still more remarkably, yet the oscillatory form, or to-and-fro motion, is usually preserved. The jerking and tremulous movements, which occur in other diseases, are observed chiefly in CHOREA, in SHAKING PALSY, in ERGOTISM, in BARBIERS, and in HYSTERIA. In all these, however, the anormal motion is a symptom merely, is often more irregular, agitative, or spasmodic, than in tremor. The motions in this disorder are very quick and very limited or slight in extent, but always passive and usually very chronic, whilst they are in those diseases more active and acute. But many varieties of tremor, or modifications, are observed, and are to be referred chiefly to the causes of this affection. Tremor is rarely observed when the patient is sleeping, although he often starts in his sleep, and when he moves, the tremor is commonly very manifest. It is also increased after muscular efforts, or even during these; and by mental excitement, especially during anger or any feeling of temper. Depressing emotions of mind, the abstraction of accustomed stimuli, fatigue, inanition, &c., also increase the tremulous motions, or even extend their sphere in the frame liable to the affection.

3. II. CAUSES. — Tremor may arise from only one cause, or it may be result of the concurrence of several. The causes which most frequently *predispose* to it are commonly such as depress or exhaust the nervous energy of a part, or of the whole frame. Of these the most remarkable are original and hereditary conformation, insufficient or improper nourishment during infancy and childhood, masturbation, premature or excessive sexual indulgences and other secret vices, unwholesome air, and the several depressing causes fully considered under the head DEBILITY (§ 6.). Whilst many of these causes, especially when their operation is prolonged or excessive, may singly occasion tremor, others more commonly *excite* it, after the nervous system has become predisposed and susceptible. Of this latter class the most common are fear, fright, or terror; various moral sentiments, as passion, anger, excessive sexual desire, joy, &c.; contusions or injuries, succussions, concussions of the brain, falls, fatigue, excessive or prolonged muscular exertions, blood-letting improperly prescribed, or excessive discharges of blood, or inordinate secretion; the local injuries of nerves, inanition, or the abstraction of accustomed stimuli; and the abduction of animal heat, in any way, whether rapid or prolonged. Most of these causes produce merely a temporary state of this affection. Those which follow more frequently occasion more prolonged or even permanent effects, although variously characterised, as mentioned above, especially as respects remissions, intermissions, or exacerbations. Those more influential causes are, the abuse of spirituous and fermented liquors or of narcotics; the excessive use of coffee or green tea; the use of tobacco in any form, especially when carried to excess; the fumes of mercury, arsenic, or lead, or the actions of those poisons in any form or way; various vegetable poisons;* sexual excesses, inordinate mental exertion, invermination, and the suppression of accustomed discharges, eruptions, &c. The most permanent states of tremor result from old age and the changes in parts, or in the whole of the nervous system from prolonged debauchery and dissipation, and from organic change in or near the origins or course of the nerves, or implicating the nerves of the affected parts. Many cases of tremor of the simplest and most permanent kind, present no manifest cause, and can only be referred to the pathological causes just assigned, although many of the changes may be too minute or much beyond our senses to be detected.

4. Tremor has been divided into several *varieties* by some authors. Thus, J. FRANK has adduced the following:—1st. The Inflammatory. — 2nd. The Rheumatic and Arthritic.—3rd. The Gastric. —4th. The Atonic. — 5th. The Nervous. — 6th. The Metallic, or that caused by metallic poisons. Among the other divisions which have been assigned by writers, the following appear the most deserving of notice:—1st. Tremor senilis. — 2nd. T. potatorum. — 3rd. T. mercurialis. — 4th. T. febrilis. — And 5th. T. paralyticus. The subject may be elucidated by a few remarks on these varieties.

5. (*a*) The *Inflammatory* of FRANK would have been more correctly named the Congestive; inasmuch as the contingent occurrence of tremor is more frequent in congestive than in inflammatory affections of the nervous centres, and is more likely to take place from general or local vascular plethora, and from morbid condition of the blood, than from inflammation. (*b*) The *Arthritic* and *rheumatic* variety of tremor is not of frequent occurrence, and is an occasional symptom, oftener observed, however, during the earlier periods of convalescence from these diseases than during their course, and especially when those diseases have been neglected, or injudiciously treated by colchicum and other depressing agents. (*c*) The *Gastric* form of tremor, contended for by FRANK, is of rare occurrence; for although tremor may be often connected with gastric disorder, the former may no more depend upon the latter than the gastric disorder may depend upon the tremor — both states of disorder being merely concurrent manifestations of the condition of the nervous centres or nervous prolongations, either voluntary or involuntary. (*d*) The *Atonic* and the *nervous* varieties of this writer may be viewed as one and the same; for it matters little whether the efficient or immediate cause be debility, exhaustion, atony, or asthenia, general or local, since the effect is nearly the same, although the causes are generally very different or even opposite in their natures. (*e*) The *Metallic* and the *Mercurial* forms of tremor are distinctions which may be admitted as serving both to point out the cause and to suggest the treatment; but these terms fulfil this purpose in a very limited and insufficient manner; for tremor may be caused not by mercury only but

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* I have at present an officer under my care who was poisoned in the north of India and recovered with difficulty. Although a large and strong-looking man, he has ever since been subject to tremor, which is much increased by and after excitement. The treatment about to be noticed has been employed with only moderate success.

also by lead, and by arsenic; and even not merely by metallic substances, but also by several vegetable poisons, as by aconite, conium, stramonium, &c. (*f*). The *Senile* form of tremor requires no remark. It is in no respect different from the atonic and nervous. (*g*) The *Paralytic* is identical with *Paralysis agitans*, and is treated of in the article PARALYSIS. It often varies in character from the slightest tremor to a more violent agitation, as above stated (§ 2.) (*h*) The *Febrile* is observed chiefly in periodic, and in low or nervous fevers, and especially in the far-advanced stages of these and sometimes of other fevers, or during convalescence from them. In these the tremor is indicative of depressed or of exhausted nervous power, especially of depressed or exhausted organic nervous power, and of some degree of alteration of the blood.

6. Tremor sometimes pertinaceously follows attack of fever, especially those of a periodic type; and, in some instances, continues for a long period, even for months, exasperated, however, by exhausting or debilitating causes. A case of this description recently came under my care in a gentleman long resident in India, and often attacked by periodic fever. The tremor had been of very long duration; it was then his only ailment; and it was much increased by exhausting and depressing causes. It was ultimately removed by quinine, and tincture of sumbul. These cases of tremor are oftenest met with in persons who have freely lived.

7. (*i*) The most frequent form of tremor is that observed in *drunkards* and *smokers*, or in those who indulge in any of the fermented or *intoxicating liquors*, or in *tobacco* or *opium* in any form. In those persons the tremors are most observable in the mornings, or during the intervals between the abuse of any of the substances indirectly causing them, and are chiefly manifested in the extremities, especially the upper. The tremor in such cases may be either simple or associated with illusions of the senses, or with delusions of the mind. In this latter case the disease is essentially that which has been usually denominated *Delirium tremens*, and which I have described as DELIRIUM WITH TREMOR. But in the former, or when the tremor is simple, the affection may vary in its severity and characters, as already stated (§ 2.), especially in the intervals between the abuse of the intoxicating agents; for the tremor generally either altogether ceases or is mitigated, as well as the usually attendant feeling of depression, sinking and anxiety, or internal misery, by recourse to the intoxicating cause. Hence the affection is perpetuated or increased, until it terminates in paralysis, insanity, convulsions, or fatal exhaustion of nervous power, with more or less marked disturbance of the excreting organs.

8. (*k*) One of the most important forms of tremor, although hitherto not mentioned by writers, is that which may be termed the *Hysterical*. It is merely a modification of the atonic or nervous state of the disorder, which may affect equally either sex; whilst the hysterical occurs chiefly in the female sex, and is a most obstinate affection, owing to its cause, viz., manustupration — a vice which, when once indulged in, is seldom relinquished, until either the mind or body, or more commonly both, are completely broken down. Hysterical tremor is variously manifested, most frequently in the eyes and eyelids, sometimes in the hands or in the motions of the head or lower jaw, occasionally in the lower extremities; and, in this last case, it is often associated with incomplete hysterical paraplegia. A case of hysterical tremor of the head and another of the lower jaw came under my observation some time ago; the former having been treated by Dr. N. GRANT and myself. In both these the oscillations were horizontal.*

9. (*l*) The last form of tremor which I shall notice is symptomatic of *intestinal worms*; and although this form is merely a symptom, and even a rare symptom, of invermination, yet it deserves mention, as respects not merely this cause of tremor, but also the states of the nervous system, which characterise both the primary disorder and the sympathetic affection. In verminous tremor the organic nervous power is both depressed and susceptible of irritation, which is propagated from the involuntary to the voluntary muscles, chiefly of the abdomen and trunk. The few cases of this form of tremor that I have seen, have been in persons from whom either tape-worm or the long round worm has been expelled.

10. III. THE NATURE OF TREMOR may be inferred from the causes and circumstances of its occurrence. Unless when it proceeds from congestion at the origins of the nerves of the affected part, and even in such cases also, tremor must be viewed as an indication of impaired power of these nerves, owing either to some change of their most minute organisation, or of those parts of the nervous centres in which they originate. That the state of the circulation in the capillary vessels of those parts, or even of the blood circulating in them, as well as change of the structures or tissues in the vicinity, may also occasion this affection, may be admitted, especially when we consider the circumstances in which it occasionally comes under our observation, especially in the last stages of nervous fevers, in various forms of delirium (as the delirium of drunkards), in some cases of poisoning by narcotics or intoxicating poisons, &c. In a few cases of hysteria, and in rare cases of intestinal worms, tremor is a prominent symptom; and is in these a sympathetic affection reflected upon some external or voluntary part or parts from the internal seats of irritation—uterine and intestinal —through the medium of the sympathetic or ganglial order of nerves.

11. IV. PROGNOSIS. — Tremor often furnishes important prognostic indications. When tremor occurs in old persons, it sometimes is the forerunner of paralysis; and when it affects parts already paralysed, it occasionally precedes returning health. Its appearance in an early stage of *fever*, or after the cold stage and during the period of increment, is an indication of severe cerebral affection; and in these cases, as well as its occurrence during or after the delirium of fevers, tremor is a dangerous affection. When it occurs in cases of *cerebral congestion*, it is a

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* A remarkable case of tremor, resembling a pulsating motion, of the muscles of the throat, was some years ago attended by Mr. Liston and myself. The question was whether it was hysterical or aneurismal, as the movements were often synchronous with the contractions of the left ventricle. The hysterical nature of the case became more manifest; and the patient returned into the country, without having allowed us time to observe the further progress of the case.

serious symptom; but much depends upon the circumstances of the case. In *gouty* and *rheumatic attacks* it is less dangerous, as long as the extremities or voluntary organs are alone affected; but when either disease has retroceded or been misplaced — internal or vital organs being attacked — and tremor appears in these cases, then the danger is imminent. If this affection be slight; if it depend upon excessive exertion, or upon inanition; or if it be of recent occurrence, it may be generally removed with the causes which produced it; but, if it occur in habitual drunkards, smokers, or opium-eaters, or in the aged, and especially if it be associated with delirium, or illusions, or with delusions in persons addicted to *intemperance*, it either is not permanently removed, or if it be alleviated, it usually returns. Tremor is seldom or never cured when it is associated with *paralysis*, or when it appears in the *insane*. Although it is not a dangerous affection, when it occurs in *hysterical females*, yet it is most difficult to cure, especially if there be reason to infer that masturbation has occasioned it, or the associated hysterical disorder. It is less serious when it is symptomatic of *worms*. It generally admits of removal, when it has been caused by mercury; but it is cured with much greater difficulty when it has been produced by lead or arsenic; and, in many of these latter cases, it is often attended by great danger. Tremor in nervous persons, and in a slight or limited form, may continue for many years, or even to an advanced or very old age, when it is unassociated with any other disorder, and when the functions, both mental and bodily, are not impaired, or even not materially impaired.

12. V. Diagnosis. — Tremor may be mistaken for several complaints, which either nearly resemble or are closely allied with it; or they may be confounded with it, more especially chorea, the cold stage of ague, the formative stage of continued or exanthematous fevers, shaking palsy, delirium tremens, the subsultus tendinum observed in the last stage of fevers, &c. — *a.* In *chorea*, and in some cases of *palsy*, caused by disease of the membranes of the spinal chord, the motions are very different from tremor. In the former disease, the motion is caused by an irregular and frequent jerk, or momentary contraction of muscles, now affecting one part, then another; whilst in the latter, there is no tremor when the patient does not exert any volition on the affected limb; but, as soon as he attempts to move that part, the movement is often tremulous, uncertain, and imperfect.—*b.* In *shaking palsy*, the tremor or shaking is constant, unless the patient is sleeping, when it is either absent or diminished, and the power of motion is impaired or lost, or nearly so. Sensation is generally but little affected.—*c.* In *delirium tremens* there is more or less tremor, generally of the hands, and often also of the lower extremities and tongue; but there are, also, illusions of the senses and delusions of the mind, and nervous excitement. But tremor is often caused by intoxicating fluids, without delirium being present; and in cases occasionally characterised by delirium, tremor is often experienced either before or after attacks of delirium, or it may continue during the intervals between those attacks. The *cold stage* of ague, or the *invasion* of continued fevers—the former especially—may resemble tremor. But, in the cold stage, there is a general feeling of cold, which is not present in tremor, whilst the motions of the former are more active, and more generally manifested in the frame than those of the latter, which are usually passive and limited to certain parts, or at least not so widely extended.—*d.* The *subsultus* of the last and most dangerous state of fevers cannot be mistaken for tremor, as the history of the case, and the nature and seat of the movement, are sufficient to distinguish between them. The tremor of the tongue, often observed in *low fevers* when this organ is protruded, as well as the tremor of the limbs on attempts at motion or progression, occurs only when volition is attempted, and is distinct from idiopathic tremor, which is always present; the former, or symptomatic, being a frequent attendant upon greatly impaired nervous power, and manifested only when voluntary motion is attempted.

13. VI. Treatment. — The means of cure should be selected with strict regard to the causes and pathological states occasioning this affection. When it is caused by mercury or other metallic poisons, the remedies advised when treating of these in the articles Poisons (see § 568. *et seq.*), and Arts and Employments producing disease, should be adopted. Under this latter head the *prophylactic measures* that may be employed against the metallic poisons are fully noticed. *Sulphur* was strongly recommended for the tremors caused by mercury by Dr. Lettsom; and *electricity* by De Haen, Manduyt, and Sigaud la Fond, not only for the mercurial tremor, but also for tremor caused by other mineral poisons. Zacutus Lusitanus advised *sulphurous* and *aromatic warm baths*, not only for those cases, but also for tremors produced by other causes. The treatment recommended by most writers for tremor, has generally been either empirical, or been based upon the presumed nervous character of the affection. *Antispasmodics* were prescribed by Martini; *blisters*, by Muys; *musk*, by Stark and Bang; the *oxide of zinc* by Fischer; *opium* by Thomann; *purgatives*, by Riedlin; *cinchona* and its preparations, by Boucher and Filleau; and the *chenopodium ambrosioides*, by J. Frank.

14. When tremor is occasioned by congestion or plethora of any part of the nervous centres, then recourse may be had to scarifications and cupping, or to the application of leeches, according to the circumstances of the case. If it be connected with gout or rheumatism, the remedies advised for these diseases are appropriate, but those which lower nervous power ought not to be adopted when this affection is symptomatic of these diseases. If it be caused by intoxicating fluids, the preparations of ammonia are generally most efficacious. When it is occasioned by cold, the warm bath, followed by frictions and ammonia, are indicated; and if these fail, cinchona, serpentaria, the calamus aromaticus, arnica, camphor, guaiacum, &c., may be severally employed. If congestion of the brain have occurred from this cause and produced the tremor, the arm or arms are most frequently the seat of the affection, and in this case, cupping, leeches, a blister to the nape of the neck, or behind the ears, or even venesection if the patient be plethoric,

as advised by Solbrig, may be prescribed. Cases have been recorded by André and others, which have recovered by means of a prolonged course of tonics conjoined with purgatives. Tremor may occur in such various, different, or even opposite circumstances and pathological conditions, whether appearing idiopathically or symptomatically, that it becomes impossible to state the means most appropriate to each of these, at least within the limits to which I am confined. In respect of this affection, as well as of most others, the physician must observe closely and judge for himself, selecting and devising his means with a strict reference to ascertained causes, and to inferred changes.

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TUBERCULAR CONSUMPTION.—Synon. — *Phthisis*, (φθισις, from φθιω I waste or decay), Hippocrates, Pliny, Iuncker, Vogel. Sauvages, Cullen, &c.; — *Tabes*, Celsus; — *Phthoe*, Hippocrates; — *Phthisis pulmonaris*, *Phthisis pulmonalis*, *P. scrofulosa*, Frank, Pinel, &c.; — *Ph. pulmonalis tuberculosa*, *p. scrofulosa*, Auct.; — *Affectio Phthisica*, Hoffmann — *Hectica Phthisis*, Young; — *Marasmus Phthisis*, Good; — *Exulceratio pulmonum*, *Consumptio pulmonum*; — Lungensucht, Schwindsucht, Lungenkrankheit, Germ. — *Phthisie pulmonaire*, Fr.; — *Tisi pulmonare*, Ital.; — *Tisica*, Sp.; — *A phthisic*, *consumption*, *decline*, *pulmonary consumption*, *Tuberculous Phthisis*.

Classif. — 1. *Class*, 4. *Order* (Cullen) — 3. *Class*, 4. *Order* (Good) — IV. Class; II. Order (*Author*, *in Preface*).

1. Definit. — *Unusually quick respiration on slight exertion, short cough, hectic fever, and emaciation: expectoration at first wanting or scanty, afterwards varying with the progress of disease, sometimes streaked with blood, or attended by more marked hæmoptysis: colliquative perspirations and diarrhœa, or both alternately, generally supervening or hastening dissolution: usually occurring in the scrofulous diathesis.*

2. Pathol. Defin. — *The infiltration of tubercular matter in parts of the lungs; the morbid deposit undergoing metamorphosis, most commonly softening and more complete solution, followed by erosion of the containing tissues, by ulcerating cavities, by successive changes in adjoining parts, especially by vascular congestion, sanguineous exudation or extravasation, or inflammatory action generally limited to the adjoining structure and to the bronchial canals communicating with the tubercular formations.*

3. In addition to the above *symptoms* and *lesions characterising tubercular consumption*, there are many others less commonly present, that can be comprised only in a more detailed description of the several forms and stages of the disease. Of these sufficient notice will be taken in the sequel. Some of the topics more fully considered in the articles Scrofula and Tubercles, will here receive a passing notice, in as far as they are more especially connected with pulmonary phthisis. The intimate connection of scrofula and tubercular formation, in all cases, and their actual identity as respects especially their causes and constitutional relations, have been fully discussed under the heads just referred to (*see* Scrofula and Tubercles, §§ 112—119. *et pluries*). It is therefore unnecessary to advert to these topics in connection with tubercular phthisis, especially as they will be made apparent during the description of the causes and organic changes of this malady.

4. The *forms* and *states* of pulmonary consumption — of tubercular disease, affecting chiefly the lungs — and the numerous complications or morbid associations, either developed in the course of this malady, as contingent and intercurrent affections, or existing in the frame as latent or as manifest disorders from the commencement, severally require due recognition and diagnosis, and claim the especial investigation and study of the physician. The early aberrations from health which indicate the commencement of tubercular phthisis have been, during the greater part of the period of which my experience is cognisant, either imperfectly estimated or overlooked; whilst undue attention has been, and still is, directed alone, to that which, although fully deserving a due portion of attention, should not receive an undivided investigation — to *physical diagnosis* in the several forms and methods, in which it has recently been paraded, over-estimated, and lauded. Owing to this one-sided study, to the fallacies inseparable from its nature and to those which arise from varying conditions of vital influence and action, from different states of secretion and excretion, from numerous disturbing causes' appearing contingently, and from habits of dogmatising with the view of exhibiting a precision of acquirement and knowledge beyond what has been previously reached, the cultivation, if not the advancement of physical diagnosis, to the neglect of the intimate observation of constitutional and physiological changes, has been generally attempted. Manipulations which strike the senses of the attendants, and more than one sense of the patient, — examinations which may be seen, felt, and talked about, have a much more impressive and lasting influence upon both patient and spectators, than the close observation of symptoms and the pertinent inquiries of the profound and comprehensive thinker. The former are lights which the possessor places upon an eminence for his own

advantages; the latter are lights intended entirely to benefit the person for whose safety they are employed. The one method strikes and impresses the patient and those around him, the other is at best but imperfectly estimated, or even altogether unheeded.

5. Auscultation, which is of great service in the progress of phthisis, is much less advantageously employed at the commencement and even during the early stage of the malady. Too great dependence upon, and a too *ad captandum* parade of, this mode of diagnosis, sometimes even with the fussiness and the flourishes of vulgar craft, have tended to the neglect of those states of vital manifestation, of disordered functions, and of vascular action, which, whilst they indicate incipient or early pulmonary disease, also characterise its forms, and point to the changes in which these forms originate, and on which they continue more or less to depend. The presence or absence of certain sounds on percussion and auscultation, the states of developement and of mobility of the several regions of the thorax, both individually and in relation to each other, are all of great importance in themselves, but this importance is heightened when they are viewed in connection with their causes and with existing conditions of vital manifestation, of morbid function and of vascular action.

6. The usual modes of physical diagnosis in respect of tubercular consumption have been sufficiently described, illustrated, practised, discussed, praised, and confided in, since the days of LAENNEC to those of SKODA, which nearly mark the period comprised by my experience; but they have not always been received as immutable truths. What was confided in by the batoned followers of LAENNEC is now disputed by the sceptical followers of SKODA. Doctors proverbially differ; but professed adepts as certainly disagree, and that the disagreement may not be the less marked and continued, the one school misinterpret or misrepresent the dogmas of the other. As among the microscopists, so among many of those who pretend to the greatest powers of auscultation —who split hairs in auscultatory diagnosis—the greatest differences occur, in the early stages of phthisis especially. What is heard by one is often not heard at all, or heard differently by another; belief frequently rendering the sense of hearing more acute and the physical signs more distinct. Not infrequently the adepts—the *specialists* of this malady, the would-be the greatest authorities, the infallible in this department of *speciality* — find evidence of tubercles in the lungs on auscultation and percussion, where none exist, or have existed, or could be detected after death.

7. I. As to the ORIGIN OF TUBERCLES I must refer the reader to that article (see SCROFULA and TUBERCLES); but I may here remark that much has been written upon this topic in former days, and at the present time it still remains a "*quæstio vexata.*" At an early epoch of pathological speculation respecting it, the formation of tubercles was imputed to impaired vital influence, and afterwards to depressed nervous energy. At a more recent period a morbid nutrition obtained credit for the mischief, although it might have been difficult to show how nutrition, however morbid, could have formed what was admitted to be neither organised nor organisable. Then it was attempted by ROKITANSKI and his admirers to describe tubercles as transitions from organised to non-organised formations. Still more recently the origin of this formidable malady was laid in the blood; and if the actual existence of the tubercular matter could not be detected in the circulation by the far-seeing—or rather near-seeing—microscopists, after the most minute search, the elements of this matter doubtless existed. Upon this latter inference they could safely count. Indeed, this part of the conclusion could hardly be denied; for, where vascular assimilation is deficient, the materials for morbid formations must necessarily abound; and the developement of such formations will necessarily most readily take place in situations and structures most favourable to the morbid process, and most exposed to the influence of the causes which predispose to, or produce it. When organic nervous power is impaired, vascular assimilation and healthy nutrition must necessarily suffer; and those tissues and organs, which are the most disposed by function and organisation, and as respects their capillary circulation and their normal secretions, to experience the early effects of these changes, will be the first to manifest disease, and the most likely to experience disorganisation.

8. Dismissing, however, the consideration of this topic, and referring to what I have advanced respecting it under its appropriate head, I shall now very briefly advert to the constitutional states in which the formation of tubercles in the lungs generally takes place, and with which they are more or less intimately allied during the greater part or the whole of their progress. These states have been very imperfectly described and distinguished from each other, both in health and in disease; the great difficulty of assigning distinctions, arising from their mixed characters, the manner in which they pass into one another, and the association of temperament, diathesis, and habit of body being often such as to obscure the subject, and to render precise and accurate observation almost impossible. Nevertheless, these states have a more or less intimate relation to the forms or varieties of tubercular phthisis, and should hardly be separated from a due consideration of the influence and modus operandi of the predisposing and exciting causes. Certain of these, especially the scrofulous diathesis, and very probably this only, have a most intimate connection with the pulmonary disease, whilst others are much more doubtfully, or even are in no ways, related to it. They should, notwithstanding, be viewed in connexion with the causes, the courses, the morbid associations, and the intercurrent affections of tubercular phthisis. The imperfect attention which has hitherto been directed to this part of the subject must be my apology for the insufficient discussion of it at this place; my object being rather to indicate, than to supply, the deficiency: to this latter end precise observation and patient research are altogether wanting.

9. i. *The Scrofulous Diathesis or Taint* is the most common constitutional condition in which phthisis occurs. It is that intimate organisation of frame which results from those predisposing causes, referable to the parent and to the infancy of the offspring, and which, with these causes, I have described when treating of SCROFULA and

Tubercles (see §§ 3, *et seq.*). But although it is most frequently the basis of the tubercular formations in the lungs, whether latent or developed—the soil in which they grow—yet these formations may appear in other conditions of the frame than this, when the predisposing and exciting causes are in energetic or concurrent operation. In this condition, however, the tubercular formations in the lungs are most prone to pursue their usual course, especially after the age of puberty, and before the period of middle age. They may also assume the acute form, especially in the plethoric, and when their causes are more than usually active.

10. ii. *The Lymphatic Temperament* has been supposed, especially by French pathologists, to predispose to phthisis more frequently than any other temperament or diathesis, excepting the scrofulous. This may be the case, for I am not prepared to dispute it; but, if the question be put as to what constitutes the lymphatic temperament, and as to what signs this temperament may be recognised? but few will agree in the answer, or be prepared to answer it at all. This much may be said respecting it, that it is very closely allied to the scrofulous taint or diathesis, that the lymphatic system is prominently developed in persons possessing it, and that the lymphatic glands and serous membranes in those persons are very prone to become the seats of tubercular deposits, whatever may be their complexions or races.

11. iii. *The melancholic, phlegmatic, and bilious temperaments* do not predispose to phthisis. When this malady occurs in either of these constitutional conditions, it is generally caused by several concurrent influences, and it frequently assumes a very protracted form, or it remains long latent before it is openly and fully manifested. It may then be far advanced, and either assume in this state a chronic form, or proceed rapidly to the usual termination. It is often, however, very difficult to determine the diathesis and temperament of persons labouring under phthisis, especially in its advanced stage; and the comparative tendencies of either temperaments, diathesis, or habits of body, to this disease, have not been ascertained with a sufficient precision to enable me to state anything with confidence on this topic.

12. iv. *The nervous, the irritable, and choleric temperaments* present no very marked predisposition to phthisis, although this malady may appear in either of these temperaments when the causes are energetic. In these the disease is prone to assume an acute, rapid, and febrile character, or to be associated with bronchitis or laryngitis; and in the nervous temperament especially, it may, in its early course, present many of the characters of nervous fever, or, in children, of remittent fever. In either of these constitutional states various complications may occur in the progress of the disease, affecting either the lungs or other organs. Although hæmoptysis may take place in either of these, it is not so frequent in them as it is in the sanguineous temperament, or in the scrofulous diathesis.

13. v. *The sanguineous temperament* is probably more disposed to phthisis than those last noticed (§§ 11, 12.); but it is more especially so disposed when it is associated with the scrofulous diathesis. It is then apt to favour an acute or febrile form of the malady, which is frequently complicated with hæmoptysis, with pneumonia, and various other lesions of the lungs and pleura. As respects this temperament, as well as the others, a more precise observation of phenomena from the commencement to the termination of phthisis, in a wider field of observation than I have possessed, is required to illustrate this part of my subject, and to render it available to practical purposes.

14. II. Description of Tubercular Consumption.— In describing tubercular consumption, or phthisis pulmonalis, I confine myself to the phenomena produced by the formation of tubercles in the lungs, although I do not overlook the fact that tubercles often exist in other organs when they are formed in the lungs, especially in young subjects. Of this circumstance notice will be taken in the sequel. Pulmonary phthisis may be viewed as a vital blight, which in the animal kingdom as in the vegetable, affects the circulating fluids by attacking the organs of assimilation and respiration. Numerous vital and physical causes, severally or concurrently, produce this result; whilst many influences, occasioning either excessive waste or imperfect supply of assimilating or nutritious elements, exert a similar effect.

15. *Phthisis* may present numerous variations in its course. M. Louis states that he has seen it prove fatal within a period varying from three months to twenty years; and the tendency of the disease to cause a simultaneous or successive formation of tubercular in different parts of the system is one of the chief reasons of these variations. I have met with cases, the duration of which has been even much longer than just now mentioned, and I will make a more particular reference to them in the sequel. The very different or varied occurrences and lesions, which may take place in the early course or advanced progress of phthisis, independently of the influence of *diathesis* and *temperament*, are such as to vary most remarkably the character of this disease. The development of tubercles in different tissues and organs; the progress of tubercular deposit, and the form of tubercles; their softening, and the excretion or absorption of the tubercular and morbid matters; intercurrent inflammations, bronchial irritations, or pleuritic attacks; the occurrence of hæmoptysis, its frequency or amount; attacks of laryngitis, tracheitis, or ulceration either in those situations, or in the bowels, with many other contingencies, either severally or in combination, impart a marked diversity in the characters, course, and duration of this malady. In order, therefore, that these variations, with their most frequent sources and contingencies, may receive sufficient attention, I shall notice:—1st. *The more usual form of tubercular phthisis*,—2nd. *The latent form of phthisis*,—3rd. *The primarily acute form of phthisis*,—4th. *The consecutively acute form*,—5th. *The protracted form of phthisis*,—6th. *Of phthisis in infancy and childhood*, and 7th. *Of phthisis in the dark races*.

16. Having considered the *forms* or *variations* of the disease as fully as my limits permit, I shall afterwards take a brief view of the complications and intercurrent lesions which may appear in the course of these forms, more especially of—1st. *Bronchial irritation and inflammation*;—2d. *Hæmoptysis in its several states*;—3d. *Inflammation, ulceration, œdema*, &c. *of the larynx, trachea*, &c.;—4th. *Inflammations or congestion of the*

lungs, or of the parts surrounding tubercular deposits, &c.—5th. *Inflammations of, effusion from, and adhesions of the pleura ;*—6th. *Perforation of the pleura, pneumathorax, and hydro-pneumathorax ;*—7th. *Diseases, especially ulceration of the intestines ;*—8th. *Fistula in ano ;*—9th. *Disorders of the uterine functions and organs ;*—10th. *Diseases of the kidneys and urinary organs generally, and their consequences ;*—11th. *Diseases of the heart and pericardium ;*—12th. *Abnormal states of the blood and blood-vessels, at the commencement and at the successive stages of phthisis.*

17. i. Of the more usual Form of Tubercular or Pulmonary Phthisis. — At its commencement phthisis may be manifest to the close observer, or it may be inferred with uncertainty, or detected with the greatest difficulty. But, as it advances, it generally becomes evident to the most careless observer. The diagnosis, however, should have reference not merely to the existence of this disease, but also to the progress it has made, as shown by the nature and combination of the symptoms and signs during its course. The division of its course, therefore, into *periods* or *stages*, according to the progress and extent of the pulmonary and associated lesions and to the nature of the symptoms, is of much importance, not only as imparting a greater precision of description, but as suggesting more appropriate indications and means of treatment.

18. *A*. First Stage. — *a*. In some cases before the respiratory functions indicate any disorder, but in others either contemporaneously with, or soon after, such disorder, the habit and appearance of the body evince more or less of falling off from the healthy condition. Cough and shortness of breathing, slight at first, and hardly observed, are early experienced. The cough is at first short, slight, occurring only in the morning when leaving the bed, consisting only of a slight hack, and afterwards recurring only occasionally or more and more frequently in the course of the day, or upon exertion. It is at first dry, or attended by a slight, ropy or saliva-like fluid. The respiration, either previously, subsequently, or about the same time, is quick or hurried on the slightest exertion; and becomes more remarkably short, as the cough continues or becomes frequent. At this period, or even previously to either cough or shortness of breathing being experienced, the patient's spirits, in some cases, are much depressed, and the pulse is weak and slow. This is more particularly remarked when the disease is produced or determined by exhausting or depressing causes, as masturbation or depressing mental emotions. In many cases, the pupil of the eye is much dilated, and the conjunctiva pale or pearl-like. Pallor of the countenance and a deficiency of the carnation tint of the general surface are also often observed, whilst the flesh is softer than natural, and somewhat emaciated. There are a general indication of languor, and a want of the elasticity of mental and bodily health.

19. These symptoms may continue for some time, without making much progress, or they may become more marked, but they are, after a longer or shorter time, according to the states of season, weather, climate, and numerous other influences, followed by greater and more general disturbance. The pulse becomes quicker than usual, especially towards evening or after meals. A chilliness, or sense of coldness, going down the spine, is experienced early in the day and again towards evening, followed by an increased heat of skin, the evening chill and heat being most complained of. The febrile paroxysm at noon may be slight, and thus overlooked, but that in the evening is attended by greater heat of skin, particularly of the palms of the hands and soles of the feet, which continues during the night, perspiration occurring towards morning. Owing to this febrile condition the patient is restless, and sleep is less sound and refreshing; cough often occurring during the night, when turning in bed, and as the disease advances. The patient readily flushes on any excitement, or after a full meal; and a tightness or oppression of the chest, or transitory pains, especially near the collar bones, are often experienced. The bowels are not much disordered, or are somewhat confined; the urine is not materially affected. The female discharges are at this stage not necessarily deranged; but they may be either excessive in quantity or frequency, or they may be scanty, difficult, or suppressed, or replaced by leucorrhœa; these disorders often accelerating, the last affection sometimes delaying, the progress of the malady.

20. Climate and weather, aided by various circumstances, very remarkably influence the progress of this stage, especially when aided by judicious treatment. With the advance of spring and summer, in this and temperate countries, the malady often appears arrested, and the general health improved. The patient sometimes gains flesh and strength; but cough and shortness of breathing seldom entirely disappear; and as autumn advances and winter returns, they become exasperated upon the slightest exposure, or even without any known exposure, and the other symptoms also are aggravated, periods of exacerbation and of relief sometimes taking place irregularly, and tending to retard the progress of this stage, or even to carry it on to the following spring and summer, if the second stage have not previously supervened.

21. *b*. *This first stage* of tuberculous phthisis corresponds with the first stage of tubercular development. The lungs at this period contain a greater or less amount of tubercular deposit, in what has commonly been denominated a state of crudity. The tubercles are generally of two kinds, as described in the article Scrofula and Tubercles (§§ 71, *et seq.*); the one more or less firm, greyish, and somewhat transparent; the other of a pale yellowish colour and opaque. At this stage, the adjoining pulmonary tissue and bronchial membrane may not have undergone any perceptible alteration, or both may present more or less redness or vascular congestion. If *hæmoptysis* have occurred in this stage, which is very frequently the case, and which I shall notice more particularly hereafter, these changes are generally present in a more or less marked degree. The symptoms thus indicating the first stage of tuberculous phthisis chiefly are, slight cough, shortness of breathing, languor, loss of the healthy colour of the surface, commencing emaciation and flabbiness of the flesh, slight hectic fever, and the state of the eyes already mentioned.

22. *c*. *The physical signs* in this stage are very often obscure. This, however, depends much upon the form in which the tubercular deposit exists in the lungs,—whether or no in that of isolated granules

or as a continuous mass infiltrated through the parenchyma. Isolated tubercles may be so minute as almost to escape observation; or they may render portions of the lung impermeable to air, either by enlarging and approaching each other, or by the formation of more recent tubercles between them. While the solitary tubercles are separated from each other by healthy tissue, physical signs may be absent or obscure; but when portions of the lung are impermeable to air by infiltration of tubercular matter, or by the development of solitary tubercles, these signs are rendered more or less manifest, especially in proportion to the greater or less extent and rapidity of the respiratory movements. The quantity and quality of the secretions formed in the bronchial tubes have, however, great influence on the nature of the physical phenomena.

23. *d. Solitary tubercles* do not, of themselves, producethe slightest change in the *percussion sound* of the lungs, even although they be scattered throughout the organ inconsiderable number. Any change of this sound depends upon an altered state of the portions of lung between these tubercles: the sound is tympanitic when the intervening tissue has lost its contractility; but the infiltration of blood, serum, &c. into the tissue, whereby the air is expelled from it, renders the sound dull. As long as the intervening tissue continues normal the sound continues normal; but it is less sonorous, if the tissue be more dense and hypertrophied than natural. Skoda disputes the statement of Dr. Stokes that solitary tubercles, when very abundant, produce a somewhat dull percussion sound. When they do so, the intervening tissue is then most probably congested, or infiltrated.

24. *e. On Auscultation* the signs of *solitary tubercles* are often indefinite, owing to their number, development, and thestateof the bronchial mucous membrane. The inspiratory murmur may be distinctly or loudly vesicular, or it may be indistinct or altogether inaudible, though unaccompanied by râles, or whistling, or sonorous sounds. Râles of every kind, as well as whistling and sonorous sounds, may be mixed with the vesicular or indeterminate inspiratory murmur, or râles or whistling sounds alone be heard. The expiratory murmur may be altogether inaudible, or as loud and strong as that of inspiration, and like this, be associated with râles, and whistling, and sonorous sounds. (Skoda.)

25. As the deposit of tubercular matter increases, "and in many cases even at its first deposition, swelling of the bronchial mucous membrane, accompanied or not by secretion, takes place, and then the same auscultatory signs appear as those described under the head of catarrh. The slow development of tubercles almost invariably takes place in the upper parts of the lungs, and hence, in such cases, we frequently find the auscultatory signs of catarrh permanent there, the respiratory murmur being elsewhere healthy. Rapidly developed tubercles, however, do not manifest themselves in the first instance at the apices of the lungs, but are frequently scattered equally throughout the whole of a lung, or of one lobe."* Skoda considers that there are no distinct signs by which the existence of acute miliary tubercles can be diagnosed. Dr. Stokes states that "if in a case presenting the signs and symptoms of severe bronchitis, or in which we observe a crepitating râle continuing without intermission, we find incomplete dulness over a considerable extent of the surface of the thorax, unaccompanied with bronchial respiration; and if the stethoscope shows that the lung is almost everywhere permeable to air, and obstructed only at certain places, or if the crepitation be too feeble to account for the dull percussion sound, we may diagnose the acute inflammatory development of tubercle." According, however, to the experience of Skoda, most cases of acute tuberculosis are unaccompanied be any of those signs, and every one of them may be present without the disease being tubercular.

26. *f. Tubercles in Masses and Tubercular Infiltration.—a.* In by far the greater number of cases of tubercular disease of the lungs, of some duration, the *percussion sound*, under one or both clavicles, is duller and emptier than natural, or is completely dull, whilst over the other parts of the thorax the sound is normal, or louder, or duller than ordinary. This is owing to the conglomeration of tubercles in the upper parts of the lungs, where they are slowly developed, increase in size, and, coming in contact with each other, form considerable masses. Tubercular infiltration also occurs in the form of a slow process of development in the upper parts of the lungs, and then gives rise to this change of sound under the clavicles. Generally when the sound under the clavicles is duller than natural, it is abnormally loud in the natural regions of the thorax, the lower part of the lung being more than usually distended, owing to respiration being impeded above. Acute tubercular infiltration takes place most frequently in the upper lobes of the lungs. It produces the same percussion sound as hepatization.

27. *g. Auscultatory Signs.*—As long as the tubercular mass, or the tubercular infiltration, is of such limited extent as not to contain within it at least one large bronchial tube, it will not give rise either to bronchophony, or to bronchial breathing, or to any consonating sound. "Vesicular respiration may continue audible beneath the clavicles even when tolerably large masses of tubercles are present in the upper lobes of the lungs, provided there be sufficient healthy tissue to produce it, and the bronchial mucous membrane be not swollen nor covered by secretion. But this is not generally the case, for we almost invariably hear an indeterminate inspiratory murmur, of different degrees of strength, often, indeed, very strong, and in most cases attended by moist râles, or by hissing, whistling, and sonorous sounds; the expiratory murmur is nearly as loud, or even louder, than the inspiratory, and is likewise combined with different kinds of râles, and whistling and hissing sounds." (*Op. cit.*, p. 302.)

28. If the tubercular masses or infiltration be of such extent as to embrace bronchial tubes, in which the voice or the respiratory murmur can consonate, bronchophony and bronchial breathing will be heard beneath the clavicles, provided the tubes are not filled by fluid or solid exudations, and should there be any râles, or whistling or sonorous sounds in the trachea, or in a large bronchial tube, consonating râles, or whistling or

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* *A Treatise on Auscultation and Percussion by Dr. Joseph Skoda; translated from the fourth Edition, by W. O. Markham, M.D.*, p. 300.—The best authority on n.

sonorous sounds, will also be heard. But if the bronchial tubes in question be obliterated, neither bronchophony, nor bronchial breathing, nor any consonating râles, will be audible, these being replaced either by indeterminate respiratory murmurs, with or without dull râles, or no murmur whatever. It is often observed, owing to the bronchial tubes being at one time filled or obstructed by mucus, and at another freed from it by coughing or expectoration, that in the course of a few minutes bronchophony is heard alternating with a dull resonance of the voice, bronchial respiration with indistinct breathing, and a clear acute with a deep dull râle, &c. Consonating and non-consonating sounds may be also heard at the same time. (Skoda.)

29. Should the tubercular masses or infiltration not be developed in the upper lobes, the respiration beneath the clavicles may be quite natural; auscultatory signs being presented over those parts of the chest which correspond with the affected portions of lung. The parts which are healthy, or which contain only solitary tubercles, yield either a weak or loud vesicular or indeterminate respiratory murmur; or every variety of râle and whistling and sonorous sounds may be audible, according as the bronchial tubes are or are not free from catarrhal affection. "There are no auscultatory signs pathognomonic of tubercular disease of the lungs; and there are none which will enable us to determine that no tubercle is present in a lung, or in any part of it." (Skoda.)

30. *b.* Of the *physical signs* in this stage, it may be said that, unless there is an obvious difference between the sounds emitted in the relative situations on opposite sides, these signs are not much to be depended on; and in very many cases an opinion as to the disease has to be formed chiefly from the local and constitutional symptoms. In other cases, with the same symptoms, the physical signs afford unequivocal indications of the existence of tubercular disease. The sound elicited by percussion is evidently less clear under one clavicle; the respiration less soft and easy, and the voice decidedly more resonant than under the opposite clavicle. And, even at this early period, the motions of the upper parts of the chest during respiration may often be seen to be unequal; one side of the thorax being more fully expanded during inspiration than the other, the side least elevated being generally that which furnishes the most evident signs of the presence of tubercles. When tubercles are diffused over a large portion of the lungs, a degree of puerile respiration occasionally indicates their presence. "A marked inequality in the sound of the respiration in different parts of the chest also affords strong suspicion of tubercular disease, when such inequality cannot otherwise be accounted for."

31. *B.* Second Stage.—*a.* The transition from the first to the second stage may be gradual and hardly manifest, or it may be rapid and evident. It is indicated chiefly by a change in the expectoration. The sputum, instead of being colourless, slightly greyish and frothy, either becomes muco-puriform and contains specks or streaks of blood, or presents minute specks of opaque matter, of a pale yellow colour. These specks gradually increase in number and in size, until they form curdly patches, surrounded by the transparent portion of the expectoration. The increased sputum is accompanied with more frequent, often more severe cough; the chills or sense of cold running down the spine, the evening heat of skin, the restlessness in the early part of the night, and the morning perspiration, although more severe on some days than on others, or on alternate days, become more remarkable; and hectic fever is unmistakeably established. The pulse is always accelerated, more especially in the evening; the respiration quick, although the patient be at rest; and the emaciation and flabbiness of the flesh increase. Languor, debility, and an inability of bodily and mental exertion, are experienced. The face is generally pale in the morning, but it becomes flushed after a meal, and in the evening, when the fever and heat of skin are present, the flush in the cheeks being more and more circumscribed as the disease advances. The pains sometimes complained of in the first stage are more frequently felt in this; and are referred most commonly to the vicinity of the collar-bones, or to one or both shoulders, occasionally to either side, and not infrequently to the back, or to one side of the upper half of the sternum. The pain is generally dull or aching, resembles chronic rheumatism; but it is sometimes acute, especially when it is referred to either side, and is then owing to the extension of inflammatory action, of a sub-acute or chronic form to the pleura. Before, in some cases, and more frequently after, this stage is formed, slight or more decided hæmoptysis occurs. In many instances the expectoration is merely streaked with blood, in others the blood is discharged in considerable or large quantity, and unmixed with the sputum.

32. *b.* These symptoms are occasioned by the *softening* of the tubercular matter, and by the changes in the parenchyma of the lungs and in the bronchi which attend it. The softened and diffluent matter, forming the expectoration, proceeds from the dissolution of the tubercles, from the tissues surrounding them, and from the bronchi, into which the softened tubercles open, and along which the softened matter passes, in the course of its excretion. The bronchi and tissues surrounding the tubercles, irritated by the morbid matter, furnish an increased and altered secretion, which, with the softened tubercular matter, constitute the sputum; and this varies in character with the extent and intensity of the inflammatory irritation induced by this matter in the adjoining tissues and in the bronchi. The cough depends upon, and is modified by, the amount and properties of the matters proceeding from these sources, and the degree of irritation thereby produced in the trachea and larynx. While these changes are proceeding in the earlier tubercular deposits, and in the adjoining structures, the inflammatory irritation thus induced extends to the pleura covering the portion of lung chiefly affected, and lymph is effused from it. The exuded lymph, coming in contact with the surface of the costal pleura opposite, gives rise to adhesions, which become cellular, and vary in firmness and extent with the duration and severity of the disease. These pleuritic adhesions are generally greatest over, or are confined to, the parts where the tubercular deposits are greatest; and, especially owing to the inflammatory action producing them, account in great measure for the pains experienced in the upper and lateral regions of the chest. The consequences of the softening and

breaking down of the tubercles are the formation of *cavities* and various *changes* in the adjoining tissues and in the bronchial tubes. These cavities are first formed in the superior lobes, whilst the lower portions of the lungs are gradually becoming tubercular, the disease generally advancing downwards.

33. *c.* The *cavities* may be formed by the dissolution of either solitary tubercles, or of conglomerated tubercles, or of tubercular infiltration. They are of all sizes, from the size of a pin's head to that of a large orange, or even larger. Their walls consist either of the lung-tissue infiltrated with tubercular matter, forming a more or less dense layer, and being in some cases of such firmness as to prevent any dilatation or contraction of the cavity, or merely of a membrane, or membrane-like sac, attached to the surrounding tissue of lung. In very old cavities the internal cavities often present a more or less dense, polished or smooth, and serous or sero-fibrous surface, whilst in others recently formed the surface varies, in firmness or softness, presenting neither of the appearances just stated, in any marked form. Between these the changes of the surface are very diverse, according to the size and duration of the cavity. The cavities generally communicate with one or more of the bronchial tubes; and are rarely free from puriform mucus, or from pus, or an ichorous pus, or from blood. Owing to these differences in the size, in the walls and contents of the cavities, as well as in the surrounding structures, and to other circumstances, the physical signs which cavities present are very different and varied.

34. The extent to which the lungs have become tuberculous, as Sir J. Clark justly remarks, varies, in this stage of phthisis, very remarkably in different cases, without a corresponding difference in the severity or duration of the symptoms. Two patients having symptoms exactly similar, may be the subjects of a very different extent of pulmonary disease. In some cases a few weeks may suffice to develope cavities of greater or less extent, while in others many months, or even years, may pass without any remarkable increase or diminution of the symptoms, or even of the pulmonary lesions. In a small proportion of cases a curative process is established, as will be noticed in the sequel (§ 145, *et seq.*) by which the tuberculous changes are arrested or partially obliterated; and if the patients' general health be maintained, the indications of tubercular deposit may gradually disappear, or at least advance no further. But by trusting to symptoms alone, the state and progress of the tubercular lesions, without having due reference to physical signs, cannot be ascertained with any degree of precision. It must be evident, however, that a degree of importance beyond that which these signs possess should not be accorded to them, and that the fallacies to which they are liable should be duly estimated.

35. *d. Physical Signs.*—The upper parts of the chest are at this period less freely raised during inspiration than in the healthy state, and this is often more evident on one side than the other.—*a.* The *sound on percussion* is dull under one or both clavicles. Skoda remarks that when the cavity is formed within a portion of air—containing tissue, the percussion sound remains unchanged; and this is true not only of a small, but even of a tolerably large cavity. The only sound which cavities situated within a healthy structure yield is the cracked-pot sound, but this only in rare cases, where the cavity approaches the walls of the thorax, contains air, and is not smaller than a pleximeter. The sound in these cases is more tympanitic over the situation of the cavity than at other parts of the chest. Cavities containing air, even when deeply seated within a portion of lung infiltrated with tubercular matter, will emit a tympanitic sound if their size be not less than a walnut. Several smaller cavities, seated close together, will produce the same sound. The more flexible and moveable the walls of the thorax, the more readily is the tympanitic sound emitted. The sound is clearer the nearer the cavity is seated to the surface of the lung, and fuller the larger the cavity. The cracked-pot is most readily heard when cavities are large and superficial. "A cavity will not yield a metallic ringing sound unless it be the size of a fist, but it does not necessarily emit such a sound, though it be of that size."

36. *e. On Auscultation*, a dry or large-bubbling crepitant râle is heard over large cavities, when their walls are yielding, and dilate and contract during respiration, the lung being attached to the costal pleura. This râle is most readily heard when there are several or many cavities, of the size of a pea or bean, scattered through the lobe; it is never heard alone, but in combination with other râles or whistling or sonorous sounds, owing to the presence of muco-puriform or other morbid exudations in the affected portion of lung, or its vicinity. If these latter be very loud the crepitation may not be heard. Skoda observes that when a few deep-seated cavities are present in a lung which is otherwise healthy, the vesicular breathing, interrupted by a few bubbles of a muffled râle, may be heard over them; generally, however, the murmur in such cases is not vesicular, but indeterminate. "Cavities with membranous walls, situated in the midst of air-containing tissue, even though of large size, never give rise to bronchophony, bronchial breathing, or consonating râles." These râles and whistling and sonorous sounds may take place in cavities, the walls of which have a thickness of at least several lines; and if their thickness be considerable, the breathing and the voice may be accompanied by metallic tinkling and amphoric resonance. When the walls are thick and unyielding, there is neither increase nor diminution of the size of the cavity during inspiration and expiration, the air neither entering into nor passing out of the cavity, and consequently no murmurs are emitted from the cavity; those which appear to proceed from it are *consonating murmurs*. But murmurs may be produced within the cavity, if its walls are flexible, and permit the entrance and exit of air during respiration, especially if adhesions of the pulmonary with the costal pleura exist over or near to the cavity. Râles and whistling sounds can be produced in a cavity only when the current of air is interrupted by the morbid secretion contained in it, or in the bronchial tubes communicating with it. The movement which this secretion undergoes during inspiration, and especially during coughing, is attended by râles, or by whistling sounds, when air as well as fluid is present in the cavity.

37. From the above, and owing to the varying

sizes, to the situations, to the walls, to the contents, and to other circumstances, of cavities, it must be manifest that *percussion* and *auscultation* afford very few certain signs of the existence of cavities. In this opinion, I am fortified by that of Skoda — the most experienced observer of physical signs in Europe. I may remark, however, that tubercular masses and tubercular infiltrations do not exist for any considerable time without producing cavities. Cavities may, therefore, be safely inferred to be present whenever the tubercular disease is of considerable standing, and when the constitutional symptoms mentioned above have existed for some time. Skoda justly remarks that "loud bronchial breathing, loud large-bubbling râles and bronchophony are often heard over cavities; but we as often, and oftener indeed, meet with cavities which do not reveal themselves to us by auscultatory signs."

38. *C.* Third Stage.—This period of the disease is merely the former gradually increased in severity —the second gradually lapsing into this. But during its progress various complications, and additional phenomena, present themselves, caused by the extent of lesions in the lungs — the increase of cavities, formation of additional ones, and more extensive tubercular deposits; by the contamination of the circulating fluids, and by disease of related or remote organs.—*a.* The thorax at this stage is generally flat instead of round or prominent; the clavicles appear remarkably prominent, owing to the depression of the ribs, to a hollow space existing between them and the upper ribs, and to the shoulders being raised and brought forwards. The sub-clavicular regions are nearly devoid of motion during respiration; and during *a full* inspiration, the upper regions of the chest seem to be raised forcibly instead of expanding with the elasticity and ease of health.

39. The constitutional symptoms are still more severe than in the former stage. The pulse becomes quicker and weaker; the hectic symptoms more pronounced; the flush in the cheeks more marked and circumscribed, particularly in the evening; the emaciation and debility greater; the cough and expectoration more frequent, especially at night and during the morning, and the breathing shorter and more oppressed. During this stage, the patient is exhausted by copious perspirations and attacks of diarrhœa, the one sometimes alternating with the other. These assume a colliquative character, and their accession at the commencement of, and continuance during, this stage, have led to the denomination of *Colliquative stage*, which has usually been applied to it. In addition to these, the feet and ancles often become œdematous; the nails of the fingers, if not before, are now incurvated; the cough and restlessness during night increase; copious perspirations break out as soon as the patient falls asleep; pains in the chest, collar-bones, and shoulders, or in the sides, are much complained of. The sweats and colliquative diarrhœa rapidly increase the emaciation, the integuments covering the more prominent parts of the back becoming inflamed, sore, and liable to ulceration from the pressure to which they are subjected. Nevertheless, the patient's appetite is often not materially diminished, and hopes of recovery are generally entertained nearly unto the last. With the emaciation and exhaustion, the mind becomes enfeebled, although the imagination is often active. During the last few days or weeks of existence, the mouth, tongue, or throat, or all these, become aphthous; the features sunk, collapsed, and sharp; and, in some cases, mild delirium, very rarely violent delirium, followed by sinking or coma, closes the scene.

40. The severity and rapidity of the symptoms and progress of the malady vary remarkably in different cases. In some a progressive wasting, with little pain, without much cough, but with diarrhœa and perspiration, in the last stage is chiefly observed; sanguine hopes of recovery being entertained. In others, and these the majority, the chills and sinkings following the perspirations during the night and mornings; the exhaustion and distress produced by the diarrhœa, the harassing cough and difficulty of expectoration; the dyspnœa and sense of suffocation; the pains in the chest, and sometimes in the bowels; the mental struggle between hope and fear, especially in the latter part of this stage, mark not only the severity of the disease, but also the distress experienced by the patient. The termination of the malady is thus characterised by a state of tranquillity, ease and gradual sinking, in some cases, and by a painful and distressing struggle in others.

41. *b. The Physical Signs* are generally the same as, or more fully pronounced than, in the second stage. *Percussion* generally emits a dull sound over the superior parts of the chest, although the excavations which partially occupy the upper lobes, and the emaciated state of the parietes, may render the sound less dull than in the preceding stage. On *auscultation*, the respiration is obscure in places, or even inaudible, whilst in others it is particularly clear, bronchial, or tracheal, or the cavernous of Laennec. There is a mucous râle, produced by the morbid secretion in the bronchi; and a gurgling sound on coughing; pectoriloquy is frequently distinct, although as often absent, in one or both sides, or present at one time and not at another.

42. *Pectoriloquy*, or the resonance of the voice in a cavity existing in the chest, is one of the most uncertain signs in this and the second stage, for the reasons stated above (§§ 35—37.). Various indeterminate sounds are also heard in different parts of the chest, often with the signs of pleuritic, pulmonary, or bronchial inflammation.

43. ii. Of certain Symptoms and Signs diagnostic of Pulmonary Phthisis.—The diagnosis of pulmonary phthisis is usually easy in the second and third stages, but often difficult in the first; for in this the physical signs furnish no more certain aid than the constitutional symptoms. Various aids, however, to the diagnosis have been recently recommended.—*A. Observations of the time during which the breath may be retained after a full inspiration* have been recommended, (the patient being sometimes desired to count as far as he can), in the first stage of phthisis, in order to assist the diagnosis, and are of some use when carefully made; but the results vary so much in different persons in health, and still more so in other diseases of the chest, which are not strictly consumptive, as emphysema, chronic bronchitis, chronic pleurisy, and pleuritic effusions, diseases of the heart, &c., that little dependence can be placed upon them, unless when viewed in connection with the exist-

ing phenomena and with the absence or presence of the symptoms and signs of these diseases.

44. *B. Observations by the Spirometer* are in some degree liable to the same objections as those just now stated. This instrument, invented by Dr. HUTCHINSON for ascertaining the capacity of the lungs for air in diseases, may however be used in incipient phthisis with some advantage, but it can be employed only in public institutions. The indications of the extent to which the lungs are obstructed by tubercular deposits, must necessarily have reference to the average capacity of the lungs, of persons of the same size, in health. Consequently it was requisite to ascertain this latter point in the first instance; and he found, after a very great number of observations of the capacity of the lungs for air in persons in health, that this capacity increased with the height of the individual in a very determinable proportion. To this part of the subject it is unnecessary further to refer, than to state that the "vital capacity of the lungs for air" was inferred from the average of upwards of a thousand persons in health, whose lungs were thus measured. *The following table shows the comparison of healthy lungs, and of lungs in the first stage of phthisis, or before softening, all cases being males:—*

No. of Cases.	Age.	Height.	Vital Capacity.		Difference.
			Healthy.	Diseased.	
		ft. in.	cub. in.	cub. in.	cub. in.
1	23	5 8	238	186	52
2	28	5 4½	206	140	66
3	37	6 2½	286	270	16
4	20	5 3½	198	120	78
5	27	5 7	230	85	145
6	45	6 0½	270	200	70
7	36	5 6½	222	182	40
8	36	5 5½	214	170	44
9	35	5 7	230	160	70
10	38	5 10½	254	140	114
11	33	5 7	230	80	150
12	28	5 7½	230	180	50
13	27	6 1½	274	260	14
14	24	5 6½	222	190	32

45. Cases Nos. 5, 10, and 11, present a great deficiency. In these both sides of the lungs were much diseased, and in the two former emphysema also existed to a considerable extent. The foregoing table, as well as the following, are taken from "*The Medical Report of the Hospital for Consumption.*" The next table shows *the comparison of Healthy and Diseased cases in the second stage of Phthisis, or after softening, all being males:—*

No. of Cases.	Age.	Height.	Vital Capacity.		Difference.
			Healthy.	Diseased.	
		ft. in.	cub. in.	cub. in.	cub. in.
1	27	5 6	214	86	128
2	21	5 5½	214	60	154
3	45	5 9½	246	85	161
4	30	5 6½	222	70	152
5	33	5 8½	238	70	168
6	26	5 6¾	222	50	172
7	28	6 0	262	70	192
8	38	5 8	238	60	178
9	41	5 9¾	246	90	156
10	42	5 8	238	60	178
11	29	5 5¼	214	50	164
12	32	5 7	230	70	160
13	42	6 0	270	140	130
14	29	6 2	286	150	136

46. All the cases in the above table show a very marked deficiency of vital capacity. In Nos. 3, 7, and 8, and probably in others, both lungs were extensively diseased. In the following table "*the vital capacity of phthisical patients is exhibited, indiscriminately, without reference to the stage of the disease, compared with that of the same number of healthy individuals:*"—

No. of Cases Observed.	Mean Vital Capacity.		Difference.	Difference per cent.
	In Health.	In Cases of Phthisis, all Stages.		
415	cub. in. 222	cub. in. 129	cub. in. 93	cub. in 42

47. *The following table shows the comparison of healthy individuals and of cases of phthisis in the first stage, or before softening:*—

No. of Cases Observed.	Mean Vital Capacity.		Difference.	Difference per cent.
	In Health.	In Phthisis, 1st stage.		
241	cub. in. 223	cub. in. 149	cub. in. 74	cub. in. 33

48. *Table showing the comparison of healthy persons and cases of phthisis in the stage after softening.*

No. of Cases Observed.	Mean Healthy Capacity.	Mean Diseased Vital Capacity.	Difference.	Difference per cent.
174	cub. in. 221	cub. in. 105	cub. in. 116	cub. in. 52

49. *C. Hæmoptysis* is often the first symptom which excites the alarm of the patient in phthisis, and the attention of his friends. The older writers often considered hæmoptysis a cause of phthisis, whereas modern research has shown that it is a sign of this disease, tubercular deposits being its cause. The following table, from the Report of the Hospital for Consumption, shows *the existence or non-existence of Hæmoptysis in* 1,381 *cases of Phthisis, arranged according to the sexes, without reference to age.—Males,* 910; *Females,* 471; *total,* 1,381.

	Males.	Per Cent.	Fem.	Per Cent.	Total.	Per Cent.
Hæmoptysis - -	563	61·9	307	65·2	870	63
No Hæmoptysis -	347	38·1	164	34·8	511	37

50. The reporters remark that a large proportion of the above cases was seen at an early period of the disease, and that not a few of them were only a short time under observation. Hence many of those in whom this symptom had not occurred when the cases were noted, would in all probability be sufferers from it during the further progress of the malady. It may, therefore, be assumed that the proportion of cases in which hæmoptysis occurs is still greater than that shown in the table. It would result from the above that nearly an equal proportion of *males* and of *females* are found to present this symptom. The following table *shows the existence or non-existence of hæmoptysis in* 1,084 *cases of phthisis; viz.,*

males, 706—*females*, 378 ; *arranged according to the sexes in decennial periods. Also the percentage of the cases in which hæmoptysis occurred* :—

Age.	Hæmoptysis occurred.		Hæmoptysis did not occur.		Total of Cases observed.		Hæmoptysis occurred per Cent.	
	M.	F.	M.	F.	M.	F.	M.	F.
0 to 5	0	3	2	4	2	7	- -	42·9
5 to 15	7	32	14	9	21	41	33·3	78·0
15 to 25	124	107	85	45	209	152	59·3	70·4
25 to 35	175	59	71	42	246	101	71·1	58·4
35 to 45	115	35	48	25	163	60	70·6	58·3
45 to 55	29	7	23	8	52	15	55·8	46·7
55 to 65	3	0	10	2	13	2	23·1	
65 to 75	0	0	0	0	0	0	- -	
Totals -	453	243	253	135	706	378	64·2	64·3

Dividing the age of 70 into two equal periods—into two 35 years —the percentage of cases of phthisis in *males* was 64 in both periods, whilst in *females* it was 67 for the first 35 years of age, and 54·6 for the second 35 years. In females, also, from 5 to 25 years of age, hæmoptysis occurred in the ratio of 72 per cent; whilst between the ages of 35 and 55, it appeared only in the ratio of 55 per cent. The reporters further state that the *stage* of the disease in which hæmoptysis occurred was noticed in 696 cases, of whom 453 were *males*, and 243 *females*, as in the following table :—

	Males.	Per Cent.	Females.	Per Cent.
Before softening -	333	73·5	176	72·4
After softening -	120	26·5	67	27·6

This table shows that hæmoptysis is much more frequent (nearly as 3 to 1) in the first period of phthisis than in the second and third conjoined, and nearly equally so in both sexes. It is very difficult to account for this greatly increased frequency of hæmoptysis in the first stage of the disease ; but it is probable that it appears greater in this stage than it actually is in practice, the whole progress of the disease having been observed ; inasmuch as the reporters admit that many of the cases were only a short time under observation, and were not seen in the far advanced progress of the malady. There can be no doubt, however, that the occurrence of hæmoptysis in so large a proportion of cases in the first stage establishes it as an important diagnostic symptom of phthisis.

51. *Hæmoptysis* is generally a symptom, but very rarely a cause, although it may determine the development, of tubercles in the lungs of a scrofulous person, or the debility induced by a very abundant hæmoptysis may have a similar effect ; and, as M. ANDRAL has shown, the infiltration of a portion of the effused blood into the air-cells and pulmonary structure may form a nidus for the primary deposit of tubercles. Notwithstanding these exceptions, as far as they may be considered as such, hæmoptysis may be considered as generally produced by tubercles, although it may be conceded that, in some cases, especially when slight or moderate, it may be viewed as the result, in common with the tubercular deposit, of the sanguineous congestion of the lungs, often preceding and attending the early stage of phthisis, especially in the scrofulous and sanguineous diatheses. It should not be overlooked that the hæmoptysis may be produced by the pulmonary congestion consequent upon impaired vital action, or upon structural lesion of the heart, and by the severity of the cough, either independently of or in connection with these conditions of the heart, the blood effused into the pulmonary tissue and air-cells proving the matrix of tubercles, as ANDRAL contends. When hæmoptysis proceeds from these morbid states it is usually copious, and is often less dangerous than the slighter states of it, more obviously dependent upon the early stages of phthisis. BAILLOU remarked that large discharges of blood from the lungs are less dangerous than small ; and, although this is very frequently but not absolutely the case, it by no means deserves the importance attached to it by PORTAL. M. LOUIS remarks, respecting this symptom in this and other diseases, that, with the exception of some cases in which it depended upon external injury, or was connected with suppressed catamenia, it indicates, with a high degree of probability, the presence of tubercles in the lungs ; and Sir JAMES CLARK states that his experience supports this conclusion. According to LOUIS, hæmoptysis occurred more frequently in females than in males, in the proportion of three to two,—a proportion much higher than stated by other observers ; and he considers it most frequent in females from forty to sixty-five, that is after the period of the cessation of the catamenia ; but in this also he is not supported by other observers in different fields of observation. The frequency of the attacks, he remarks, was generally in proportion to the duration of the disease ; the more copious discharges having rarely occurred oftener than twice or thrice in the same persons. "In all his cases it was present, in a greater or less degree, in two-thirds ; and the numbers in which it was copious and inconsiderable were nearly equal." In some it was a frequent symptom during the whole course of the disease, in others it never appeared. In persons advanced in life and in young children it rarely occurred, and then chiefly towards the close of the disease. In rare cases it was the first symptom, even before the cough, occurring suddenly, and, as M. LOUIS asserts, in the midst of perfect health, and without any appreciable cause. This latter assertion does not agree with my experience, nor with that of Sir J. CLARK, who very justly remarks that he has generally found the aspect of the patient to have been by no means indicative of perfect health, although he may not have complained ; and that he has more frequently known the hæmorrhage to succeed bodily exertion, such as running, ascending heights, or long speaking, than when no such evident cause had occurred. In these cases, the hæmoptysis often does not appear until a few hours after the exertion. I entirely concur in the opinion here expressed in opposition to M. LOUIS.

52. The quantity of blood expectorated varies remarkably from a teaspoonful or tablespoonful to one or even two pints ; most frequently, it is only about two or three mouthfuls. In some, the blood merely appears in clots or streaks in the sputum, in others it is distinct and in some quantity ; when the

latter, it is generally pure, sometimes frothy or florid; at others dark or slightly clotted. Very large quantities are brought up with varying remissions; but at an advanced stage of phthisis the hæmorrhage is usually continuous, until several pints are discharged, and the patient is sunk by it or suffocated. This copious hæmoptysis is generally owing to the erosion of a considerable vessel by the tubercular ulceration. It is not very often that great hæmorrhage occurs at an early period; and yet I have known cases in which upwards of 100 ounces were lost at the commencement of the disease. Hæmoptysis, therefore, taking place either before or after cough or shortness of breathing, should be viewed as indicating tubercles of the lungs, although it may arise from disease of the heart, associated with the same symptoms only in very rare instances.

53. *D. Cough* is generally the earliest symptom of phthisis, but it is often so slight as not to excite the attention of the patient or his relatives; and for some considerable time it may occur only or chiefly in the morning. In such cases, and at this early period, the character of the cough, the state of breathing, and the appearance of the features, particularly of the eyes, ought to be examined, and the representation, often adduced, that it is merely a stomach-cough, or from laryngeal irritation, should not receive any attention; for it may be either or both of these, and not the less depend upon, or be connected with, tubercular deposits in the lungs. The continuance of the cough for weeks, or even months, without any expectoration, is of itself sufficient to cause strong suspicions of its origin. The association of the cough with shortness of breathing, any exertion causing cough or increasing the quickness of respiration, is an additional proof of the nature of the disorder. The cough is after a time observed in the course of the day or upon suddenly changing the apartment or the temperature, or upon reading, exerting the voice, &c., and it is afterwards followed by the expectoration of a transparent frothy fluid, which is often represented as coming from the pharynx and fauces. The cough generally increases with the progress of the pulmonary lesions, but such is not always the case; for, as will be stated hereafter, it may be very slight, or almost absent throughout the disease, or appear only a few days before death. Such instances have been remarked by PORTAL, LOUIS, ANDRAL, CLARK, and myself. In the course of the chronic and more protracted cases of phthisis, even when tubercular excavations undoubtedly exist, it is not unfrequently observed that, in favourable circumstances, cough and expectoration disappear for weeks, but return upon exposure, or from errors of regimen. In the advanced progress of the malady, cough is generally severe, occurs at all times, often without any evident cause, but especially at night and in the morning, disturbing sleep, occasioning pain in the chest, or even in sometimes causing vomiting. In the last stage it is often followed by breathlessness amounting to a sense of suffocation in some cases, or to sinking in others. The cough at the commencement of phthisis is entirely owing to sympathetic irritation of the larynx, and not to a fluid which requires to be expectorated. As the malady proceeds, it is chiefly caused by the discharge of the morbid secretions from the bronchi, or from both the bronchi and the cavities.

54. *a.* Tubercular or *phthisical cough* may, however, be confounded with the *cough of catarrh*, or of *influenza*, or of *gastric*, *hepatic*, or *nervous disorders*. Of the *first*, it may be said, that the attack is readily referred to its cause, is well marked and preceded by the usual symptoms of catarrh, either slight or acute. It is often attended by hoarseness, by soreness of the chest or trunk; and although at first dry and hoarse, it is soon followed and accompanied with expectoration, which is at first colourless, frothy, but afterwards opaque or mucous, yellowish, or muco-puriform; both cough and expectoration generally diminishing with this change of the sputum, and shortly ceasing altogether. When, however, the catarrh assumes a chronic form, or becomes exasperated, and passes into bronchitis, the difficulty of diagnosis may be much greater. *Bronchitis*, acute or chronic, will readily be distinguished by the symptoms and signs described in the article BRONCHI — *Inflammation of*; and *chronic catarrh* will be readily recognised as such, although, in consequence of the state of the lungs before the catarrhal attack, it may pass into phthisis; the shortness of breathing, the increased severity of the cough in the morning, the chills in the early part of the day, the age of the patient, the appearance of the eyes, and the occurrence of hæmoptysis, evincing the transition into, or the pre-existence of, tubercular disease.

55. *b.* The cough of *Influenza* cannot be readily confounded with the cough of phthisis, if the character of the constitutional symptoms of the former, especially the pains in the head, back, and limbs, the general malaise, and the prevailing epidemic be taken into account. Influenza, as well as measles, hooping-cough, and other epidemic diseases, when attacking persons whose lungs are prone to tubercular deposits, may determine or excite the phthisical malady, or may develope it into a very manifest, acute, and rapid form, if it had previously existed in a latent form, or in its first or least apparent stage.

56. *c. Gastric Cough* is readily mistaken for the early stage of phthisis, but it is louder and harder than the latter, is more paroxysmal, and often manifestly excited by some of the more prominent symptoms of indigestion, as by flatulency, acidity in the stomach, acid or acrid eructations, by a loaded tongue which is red at the point and edges, and by various other dyspeptic phenomena, especially by disorders of the bowels and liver, and by a loaded or high coloured state of the urine. Gastric irritation may, however, be associated with the first stage of phthisis; and, when this obtains, the diagnosis will be more difficult; but the former disorder will generally declare itself, and claim the chief attention, as the readiest and surest indication for aiding the latter affection. A *stomach-cough*, often of much severity in the morning, when a grey tenacious mucus is expectorated — the cough being severe in consequence of the difficulty of bringing up the tenacious phlegm — is not so readily mistaken for a phthisical cough, as it is generally observed in connection with manifest signs of indigestion, and in persons of mature age, or advanced in life, and of a gouty or rheumatic

diathesis, or in those addicted to full living, or to the enjoyments of the table.

57. *d. Hepatic Cough*, owing to its dryness, or to the slight mucous expectoration attending it, may be mistaken for the first stage of phthisis. But due attention directed to the state of the hepatic functions and to the region of the liver; the pale, sallow, and sunken appearance of the countenance; the disorders referrible to the stomach and bowels, and various other sympathetic phenomena contingent upon biliary and hepatic affections, will sufficiently indicate the source of the cough, when due attention is directed to it.

58. *e. Nervous* and other *Sympathetic forms of cough* are occasionally observed, especially in delicate persons; and, chiefly as occurring in these, both excite suspicions of phthisis, and require investigation. A *nervous cough* is apt to occur in females both after and before puberty, and especially as a sequela of hooping-cough, or of measles, and often excites alarm, not merely as it simulates, but as it may actually complicate, the first stage of phthisis. This cough is generally paroxysmal, is severe, and in protracted attacks, being sharp, barking, or tracheal, and without, or with merely a slight watery, expectoration. In females it frequently presents a hysterical character, with indications of nervous irritability and of uterine disorder, as catamenial disturbance, leucorrhœa, pains in the loins and the lowest part of the spine or sacrum; it is often occasioned by masturbation, and not infrequently disguises, as well as complicates, the first stage of consumption. *Intestinal worms* may occasion a cough, especially in young persons, which, owing to the pallor, flaccidity of the tissues, and emaciation, as well as to the short, dry, and hacking form of the cough, may be mistaken for incipient phthisis. Attention to the abdominal functions, to the state of evacuations, and inquiries as to the symptoms of verminous disorder, will generally indicate the nature of this cough.

59. *f.* Although the *diagnosis* of phthisical cough from other forms of cough is important, yet the mere determination of this point ought not to lead us to overlook the fact that they may severally complicate phthisis, especially in its first stage, may mask this stage, and may, moreover, either excite and determine its existence, or develope it into active and manifest forms, when it had previously existed in a slow or latent state. Whether, however, these forms of cough occur independently, or as a complication of phthisis, their removal by judicious treatment is requisite, inasmuch as they are injurious to the constitution, even when existing independently, and are sources of aggravation to the pulmonary disease, when they are complicated with it.

60. *E. Shortness or Quickness of Respiration and Dyspnœa.*—Quickness of breathing is one of the earliest indications of phthisis, especially when occurring in connection with a hacking or short cough, (§§ 53.). It has generally a marked relation to the quickness of pulse, and the severity of the febrile symptoms; in the more latent and chronic states of the disease it is not experienced unless more or less physical exertion be used; but on ascending a height, or on other occasions of exertion, the breathing is not only quick, but is also attended by more or less dyspnœa and sense of oppression in the chest. As the malady advances, especially in its more febrile forms, and when cough and expectoration are considerable, respiration is very quick, the acceleration being much greater in proportion to that of the pulse than in health or at an early stage; and the sense of oppression and dyspnœa are also greater. These symptoms are evidently caused by the extent to which the lungs are rendered incapable of their functions—to which the capacity of the organ to receive and hold air is impaired by tubercular deposits, by condensation of portions of the pulmonary structure, and by sanguineous congestion of other parts; the occurrence of hæmoptysis, by removing the latter morbid states, often relieving the cough and the breathing for a time. The state of the heart's action, an impaired contraction of its parietes, distension of its cavities owing to impeded circulation through the lungs, may severally also increase the pulmonary congestion, and the oppression and quickness of respiration, and favour or even occasion an attack of hæmoptysis. In many cases, quick or difficult breathing is not experienced until after an attack of hæmoptysis. In these it may be inferred that the hæmorrhage either increases the weakness of the heart's action, and favours congestion of its cavities, or infiltrates the bronchi and air cells, or structure of the lungs, so as to impair the capacity of the organ for the reception of air; an increased frequency of respiration being consequently required to make amends for the diminution of capacity. In all cases, therefore, the state of the respiration should receive attention, and the cause of its increased frequency or its difficulty ascertained, particularly as respects the existence of lesions within or without the lungs—in the bronchi, air-cells, and pulmonary tissue, or in the cavity of the pleura, or in the heart.

61. *F. Expectoration* is not usual until the cough and acceleration of breathing, with quickness of pulse, has continued for some time. It is at first scanty, transparent, ropy or tenacious, greyish or frothy; often resembling saliva. After an indefinite period, specks of an opaque matter are seen in the transparent frothy fluid. "These specks differ in appearance, being at one time white, at another yellow, or even approaching to green, and again very frequently of an ash colour; partly sinking in water in little masses." The greyish and ropy portion of the sputum partly float in it, in the form of striæ, suspending the minute tubercular masses. Before or about the time of the change of the sputum to this state, streaks, or specks, or even small clots of blood are occasionally seen in the expectoration. As the malady proceeds, the sputum becomes more opaque, of a yellowish hue, and is coughed up with more ease, and in more distinct masses. At a later period, the sputum is of an ash colour, and is brought up in distinct, rounded, flocculent-like masses, enveloped in the transparent ropy portion. If the patient be directed to expectorate in a glass vessel two-thirds full of water, some of these masses will be seen to sink to the bottom; others, which are frothy, will float on the surface, and parts of these will be suspended at different depths, often retaining the minute, cheese-like, or flocculent, tubercular specks or masses, or allowing these to sink to the bottom, yet connected with the surface by the more fluid and ropy portion of the expectoration. This change of the

sputum into ash-coloured, distinct masses, with more or less of a thin mucous fluid, occasionally occurs only a few days before death, but more generally it has continued for many weeks or even months before this event. In some instances it retains the yellowish, puriform appearance, and forms smooth, flat patches; and in rarer cases it is semi-transparent, tenacious, and gelatinous, and, as in bronchitis, is separated with great difficulty from any vessel containing it. "During the last days of life the expectoration is in a more dissolved state, and sometimes of a darker hue; about this period, also, and often long before, it has a very fœtid odour; finally it diminishes gradually, and often disappears entirely some days previous to death." (Clark.)

62. Such are the usual appearances of the expectoration; but the periods at which it commences, and at which the changes take place, differ in different cases. Its characters also vary, or differ much, as certain complications or intercurrent affections occur in the course of the malady, as catarrhal or bronchial attacks, inflammation of the lungs or pleura, &c. The transparent, tenacious, and frothy sputum, although generally accompanying tubercular deposits, is only a secretion from the bronchi, and may take place independently of these deposits. The yellowish-green sputum, often also observed, is frequently discharged in chronic catarrh, and towards the termination of bronchitis. These, although often abundant in, and forming the chief part of, the expectoration in tubercular phthisis, proceed from the bronchial membrane. The two characters, however, which may be considered peculiar to that attending phthisis, are the striated mass, with a mixture of whitish fragments in it, and the ash-coloured, globular masses, which are observed in the more advanced stage of the disease. I agree with Sir James Clark in considering these as very rarely unaccompanied with tubercular disease.

63. The quantity of the expectoration varies remarkably in different cases, and is by no means commensurate with the extent of pulmonary lesions. It may be very small, or almost altogether absent, although large excavations are found after death; the disease having advanced rapidly to this issue. Even in an early stage, and while it is still transparent, the quantity is often very great; the disease also in these cases assuming a febrile or rapid form. Portal, Andral, Clark, and the Author, have met with rare cases in which the expectoration has been entirely wanting, and the cough very slight up to the very close of life, and yet small tuberculous vomicæ and most extensive tuberculous deposits, in some cases, and large excavations in others, were found after death. The cases of this description, which occurred in my practice, had been mistaken before I saw them for low nervous or typhoid fevers, although the rapid pulse, the still more rapid breathing relatively to the quickness of the pulse, the appearance of the features, the night-sweats, the emaciation, and the appearances of the fingers and nails, might have shown the nature of the malady, independently of the physical signs. As to the sources of the expectorated matter, it must be evident that, before softening of the tubercles has occurred, and before they have communicated with the bronchi, the bronchial membrane has supplied it, in consequence of the irritation extended to this membrane from the morbid deposit, and of the congested state of the pulmonary vessels, of which the tubercular deposits and the expectoration are the common and combined results. The softened tubercles and the surfaces of the cavities consecutively formed also supply a part, often very small, of the sputa, more especially that part which is the most characteristic of the malady. In cases where the expectoration is either scanty or nearly wanting, the severity of the constitutional symptoms, the rapidity of their progress, and the indications of a contaminated state of the circulating fluids, render it extremely probable that the morbid secretion from the surface of the cavities as well as the liquefied tubercular matter, are absorbed, or imbibed by endosmosis, and carried into the blood, which it thus poisons, thereby heightening and accelerating the symptoms. From the above it may be inferred, that the state of the expectoration should always be viewed in connection with the other phenomena of the malady; that it affords little evidence of tubercles in their early or crude stage, but when the change takes place in the sputum, and the debris of tubercles are present in it, then a very satisfactory proof is thereby furnished of the existence of the disease in an advanced stage. Besides the appearances of the sputa already considered there are two others, which deserve a special notice, viz.: *hæmoptysis*, from its frequency and importance (§§ 49. *et seq.*); and *calcareous concretions*, from the various considerations suggested by them.

64. *The expectoration of calcareous concretions* from the lungs, occurs either months or years after the appearance of pulmonary symptoms — generally after years have elapsed, — the patient either having recovered, or partially recovered, and having experienced a relapse. The size of these concretions varies from that of a hemp-seed to that of a pea or small bean. This last size is the largest I have seen, and was expectorated by a lady in the last stage of the malady, which had been of many years' duration. A medical friend was sent up the Mediterranean in 1820 for change of climate in the first stage of phthisis. He recovered, but expectorated these concretions on several occasions long afterwards. He is now alive and in good health. Another medical friend lately called upon me and stated himself to have been then, and long previously, in good health, with the exception of a loud whistling noise, during both inspiration and expiration, which could be heard in any part of the apartment in which he was. He told me that he was considered to have been consumptive many years before that time. I said that he would soon expectorate one of these concretions, and he did so in a few days. It was of the shape and size of a split pea. He is in good health. But these concretions are not met with in these circumstances alone, but also in others much more serious or altogether hopeless, as in the last stage of the more chronic and protracted cases. They are then especially brought up with a copious expectoration, sometimes without any blood, at others with streaks of blood, but rarely with a more copious hæmoptysis. In a case now under my care the patient, in the third stage of phthisis, has expectorated a number of these concretions.

She has been consumptive for many years; and for several years before the disease had reached this stage had occasionally brought up, with little apparent ailment, one or more of these concretions. When they appear in a state of apparent health, they are unattended by much or even any sputa beyond a little mucus, or mucus streaked with a little blood or bloody specks. The pathological conditions in which they are usually found will be noticed hereafter (§§ 146.).

65. *G. Pain*, especially acute pain, rarely attends the early stage of phthisis; but a slight or aching pain is often felt, although not often mentioned by the patient, in the shoulders, or near the clavicles or upper regions of the chest. In the second and third stages, pain, often of a severer character, is frequently experienced, and is generally referred to either side, or to the situation where the tubercular lesions are most advanced or extensive, and where the pleura has become implicated. When adhesions are formed between the opposite surfaces of the pleura, pains often severe are experienced, not only in one or both sides, but also in the back or under the shoulder-blades. They are different from those of catarrh, bronchitis, and influenza, which are experienced chiefly under the sternum when coughing, and are characterised by a sense of soreness rather than by acuteness or sharpness. In some cases pain has been felt under the short ribs, and, owing to the lowness of the situation, has not always been referred to its true source. But it will generally be found to proceed from adhesions of the pulmonary, to the diaphragmatic or costal pleura. When the bowels are disordered it may be caused by the state of the colon, but in this case the pain is not persistent and often shifts its situation.

66. *H. The pulse* often furnishes important indications of phthisis, even before any of the phenomena already noticed can be detected. In persons about or after puberty, who are of a scrofulous diathesis, a frequent pulse, or a pulse above 80, should be viewed with suspicion, more especially if it be associated with a dilated pupil, a clear or blue, or pearly conjunctiva, and shortness of breathing. In many chronic cases, the pulse may not be accelerated, even throughout the disease, or until its close, and may be considerably under 70 in the minute, especially in phlegmatic and bilious temperaments. A slow or natural pulse, the breathing being not much accelerated, is observed only in the more protracted cases, and when there are indications of amendment. Great quickness, smallness, or softness of pulse occurs chiefly in the more febrile or rapid cases; and in these the chances of amendment are very few.

67. *I. Hectic fever* approaches generally slowly and insidiously in phthisis, often appears in its slightest form early in the disease, and becomes more marked as the second and third stages are reached. In some cases, however, hectic is wanting, or is so slight as not to excite notice until it breaks out suddenly and severely with all the symptoms of an advanced and acute state of the malady. It is unnecessary for me to add at this place to what I have advanced upon this topic, when describing the successive stages of phthisis, and when treating especially of the several states and causes of *hectic fever*. To that article I therefore beg to refer the reader. See Fever, Hectic, (§§ 292, *et seq.*).

68. *K. The digestive functions* are generally more or less impaired at the commencement of phthisis, and even before pulmonary symptoms have appeared; assimilation and nutrition being also imperfect. The bowels are often not materially disordered at an early stage. They are, however, frequently more or less slow or confined, but very readily become free, or even profuse, after recourse to aperients. As the malady advances, especially as the pulse becomes frequent and hectic fever developed, the bowels are irregular in action, are sometimes costive, and afterwards spontaneously and very freely relaxed, or even purged. In more chronic cases, the bowels often continue regular, and the stools are well coloured with bile, for a long time; but when the disease is far advanced, and especially towards its close, *diarrhœa* generally supervenes, and rapidly emaciates and exhausts the patient. In most cases, even early in phthisis, an active purgative, given to remove costiveness, not infrequently acts excessively; and a gentle aperient at an advanced period often produces the same effect, and occasions a diarrhœa which it may not be easy to arrest. It is chiefly in the second and third stages that diarrhœa becomes severe or obstinate. M. Louis found it in one eighth of his cases from the beginning until death; in the majority during the latter stages; in some during the last days of life only; and in four out of 112 cases it did not occur. It is often a most distressing symptom, is preceded and accompanied by severe pains, followed by great sinking and exhaustion, and is followed by rapid emaciation. The evacuations are at first yellow and bilious; but they often become watery, curdly, offensive, or emit a sour odour; the diarrhœa depending, as I have shown at another place, upon the state of the follicular glands and mucous surface of the bowels, produced by the morbid condition of the blood, and by the elimination of morbid or effete matters from the circulation, by the intestinal follicles, disease of these follicles and ulceration ultimately taking place (See Art. Fever, Hectic, § 306.). Diarrhœa often diminishes the cough and expectoration, but it seldom abates the morning perspirations.

69. *L. Emaciation* is generally present, unless the patient is carried off, before it has advanced far, by some complication or intercurrent affection. Frequently more or less wasting may be observed early in phthisis, and in some it is the first symptom which attracts attention, especially when the disease is occasioned by vitally depressing and exhausting causes. In other cases the malady is advanced far before emaciation is considerable. This symptom is often associated with some degree of pallor and indications of deficiency of red globules, or of a thin or poor state of the blood; and this is the more remarkable, as well as the rapidity of emaciation, as the febrile symptoms and the diarrhœa increase. The state of the blood, even early in the disease, and the arrest of assimilation and nutrition, the consequent waste of red globules, and the impaired or deficient development of others, readily account for the emaciation, and the state of the circulation, as regards both vascular action and the vascular contents. Emaciation is an early symptom in many obscure cases, especially in persons above thirty or thirty-five years; it is not so generally observed at a very early period in young persons,

especially in females, who are still regular or nearly so in their menstrual discharges. When it occurs without any manifest cause, and especially when it is attended by quickness of pulse, by morning chills, or by a sense of cold in the course of the spine, or by a short hacking cough, or by shortness or oppression of breathing, tuberculous disease of the lungs may be inferred; and, if all these symptoms be present, the fuss, parade, manipulation, and charlatanry of a physical examination of the bare chest, so often unnecessarily and even injuriously practised, may in most cases be dispensed with.

70. *M. The fingers and nails* often early, but frequently also not until an advanced period, betray the existence of phthisis. The nails become uncated or bent inwards upon the extremities or tips of the fingers, which are wasted; the last joints appearing enlarged or rounded, and clubbed or terminating in a coniform shape. This appearance is most remarkable when emaciation exists, and, with the symptoms just mentioned, or even alone, is a most unerring sign of tubercular phthisis.

71. *N. Œdema* of the extremities, especially of the lower, is observed chiefly or only during the last stage of phthisis. It may, however, appear earlier in delicate females, and when the catamenia are suppressed. It is sometimes so remarkable as to amount to anasarca; and, when this occurs, tubercular deposits in the structure of the kidneys, or albuminous changes in the urine, may be suspected.

72. *O. Morning perspirations* are amongst the most distressing symptoms of phthisis. The disease may be far advanced, and hectic symptoms long present, before the perspirations become copious, or are complained of. When they appear, the second, if not the third stage of the malady may be considered present; and they are then excessive, in relation to the chills and febrile reaction which precede them. This symptom is rarely absent, but it sometimes does not appear until nearly the close of life. Louis states that he has found it wanting in one tenth of his cases. When it has been wanting, I have observed the surface of the skin remarkably harsh or rough, abounding in epithelial scales, and foul or sordid. In these cases perspiration breaks out about the face and neck. It usually occurs about the same period of the disease as the diarrhœa, and depends upon the state of the blood occasioning that affection. It has been said to be vicarious of the diarrhœa, one being diminished when the other is increased; but this is not commonly the case, or in a slight degree only. The perspirations take place chiefly in the early hours of morning; if at all present early in the disease, they are only slight, or are confined to the head, neck, and chest; but when abundant, or at a far advanced period, they break out generally over the body, and whenever the patient falls asleep. Occasional intermissions or remissions of them are observed. When they are abundant a rapid termination of the disease may be inferred. The state of the perspiration is diagnostic of the stage rather than of the existence of phthisis; for when this symptom is manifest there can be no question of its nature.

73. *P. Aphthæ* are common in the last days of phthisical existence, during a week or two before death. They are sometimes slight, and in others severe. They may extend over the mouth, fauces, and pharynx, rendering deglutition difficult, painful, or even nearly impossible. When severe, the patient rarely lives many days; and yet, in two cases of chronic or protracted phthisis under my care, the patients rallied, and lived two years in the one case, and three in the other, after aphthæ were present for a considerable time in a severe form.

74. *Q. The hair* falls out in the advanced stages of the febrile or acute cases, and becomes more and more thin, and in the mornings wet with perspiration. But in the chronic and protracted states of the disease, it generally continues abundant, or in its usual state, nearly to the last, or until a short period before death. It often falls out very early when the malady has been caused by masturbation or premature or excessive sexual excitement.

75. There are various other contingent phenomena which sometimes supervene in the course of phthisis. Some of these either accompany certain forms of this disease or result from complications which will be noticed in the sequel. Irritability of temper, nervous susceptibility, tremors, sinkings, &c., are often observed in the course of the malady, are consequences of the exhaustion of organic nervous power, and the consequent impairment of assimilation and nutrition, and the waste of the tissues and blood-globules. Nevertheless, the appetite of the patient, although fastidious and various, is generally not remarkably impaired. In the more chronic cases it is often natural, or but little diminished, until the last days of life. The mental powers are not materially affected. The reasoning faculties and the imagination are even unusually acute. In some cases, of the febrile form especially, slight or mild delirium occurs towards the close, but it is seldom violent unless the membranes of the brain become the seat of increased vascular action, with or without tubercular deposits, or the treatment is injudicious.

76. iii. Of Certain Forms or Modifications of Phthisis.—The *more usual form* of phthisis having been described, with due reference to its stages and prominent symptoms, and to those physical signs which indicate the commencement and progress of the malady, in as far as they are entitled to confidence, or deserve to be made the basis of diagnosis, I proceed to notice briefly the more marked forms which the disease may assume under the influence of constitution, diathesis, predisposition, and causes. On this part of my subject much may be advanced, both as topics of speculation and as matters of important practical interest; much also may be remarked requiring further elucidation and more accurate investigation. Where the data are not positive, doubts may lead to more patient research, and to more positive knowledge.

77. *A.* The Latent Form of Phthisis.—This form is always insidious in its accession and progress. The patient is debilitated, indolent, mentally and physically depressed, and often complains of general malaise. The health is impaired, and lowness of spirits experienced. Emaciation is slight, and advances slowly. This state may continue some months or even years, and may be viewed as owing to nervous debility, or as approaching to hypochondriasis. The digestive, assimilating, and nutritive powers are more or less

manifestly impaired; the surface is pallid and cool; the conjunctiva of a pearly hue, and the pupils usually dilated. The pulse is at first slightly or not at all accelerated, or quick or small; but becomes rapid on slight excitement, when also the breathing is short. Slight chills are afterwards felt, or a sense of cold in the course of the spine, followed by heat of the palms of the hands or soles of the feet, and an increase of pulse. A short or slight hack or dry cough is observed, especially in the morning, or after exertion, when the breathing becomes short or oppressed. These symptoms are commonly but little attended to by the patient, although they often excite the anxiety of those about him. Aching pains are also sometimes experienced about the clavicles and upper regions of the thorax, but these also often fail to excite attention, or are viewed as rheumatic. Upon examination, a slight dulness on percussion, a feebleness of respiration, and a slight tracheal character of the vesicular murmur, or a louder or longer expiratory sound are the chief physical signs.

78. Latent phthisis may occur in all temperaments, especially in the lymphatic, nervous, and bilious, and at all ages, and not infrequently in the aged. In younger persons these symptoms sometimes disappear after change of climate and judicious treatment; or they increase and are followed by the greyish expectoration attending the first stage (§ 18.); but generally, after many months, or even some years, the disease passes into one of the more declared forms about to be noticed; or the patient, having either partially or altogether recovered, expectorates the calcareous concretions noticed above (§ 64.), often with little cough and scanty sputa; the expectoration of these sometimes occurring at intervals, or ceasing permanently, recovery being complete. Most frequently, however, after exposure, or after difficult, scanty, or suppressed catamenia, or after a severe catarrh, bronchitis, or limited pneumonia, or after influenza, measles, fevers, hooping-cough, &c., and even without any manifest cause of exacerbation, the disease passes into a chronic or a protracted, but open and manifest phthisis, or into a consecutively acute form, with the usual expectoration, perspiration, diarrhœa, emaciation, &c., and with the physical signs attending the far advanced states of the malady. Hæmoptysis is not frequent in this form unless in its latter stages. The disease may continue latent in females, often masked by other ailments, as hysteria, chlorosis, uterine disorders, dyspepsia, bronchitis, or by pregnancy, until, upon the disappearance of the catamenia, or after parturition, or suckling, it breaks out into an open and acute form, and terminates rapidly, generally with fever, and sometimes with delirium.

79. This form of phthisis sometimes follows depressing or exhausting *causes*, or prolonged or neglected dyspepsia and impaired assimilation and nutrition, or catarrhal or bronchial affections, or hysteria, or pneumonia, or pleurisy, or affections of the throat, or partial anæmia; and these, or other contingent or intercurrent disorders, may mask its early course, in both sexes, and at all ages, until it assumes one or other of the manifest forms about to be noticed. It is frequently connected in its origin and progress with a poor state of the blood, or deficiency of the red globules; this state of the blood, in connection with impaired organic nervous power, either occasioning or developing the tubercular deposits.

80. The *lesions* most commonly seen in this form, are cicatrices in the upper lobes, with or without calcareous formations in or near their centres; crude and softened tubercles; both old and recent cavities, the former being somewhat contracted and having their surfaces smooth, or presenting a fibro-serous appearance, and adhesions both old and recent between the opposite surfaces of the pleura in one or several places.

81. *B.* Primary Acute or Rapid Phthisis.— This form occurs in persons apparently in good health, breaks out suddenly, and runs its course rapidly — in from five or six weeks to three months — owing either to the extent and severity of the morbid action, or to the feeble powers and defective vital resistance of the patient's constitution. This state of the disease occurs chiefly in young persons, and is often developed by measles, fever, scarlet fever, influenza, catarrh bronchitis, pneumonia, or hooping-cough; and, although symptoms of tubercular disease were not evident before it supervened upon these maladies, or otherwise rapidly broke out, it may be inferred that it had previously existed for some time in a latent state, and that, when it had reached a certain extent, the symptoms and signs of its presence became rapidly manifest. In some cases severe physical exertion, fast running, loud speaking, has determined an attack, with more or less hæmoptysis and all the more violent and unfavourable symptoms of the malady. In these cases, the diseases just mentioned and other efficient causes have called the latent tubercular deposits into activity, not merely developing and accelerating their progressive changes, but also exciting morbid actions in the structures surrounding or adjoining them. That this view is correct is shown by the occurrence of this form chiefly in the scrofulous, lymphatic, and inflammatory diatheses, and in members of a family in which others have been subjects either of external scrofula or of phthisis. That the diseases just mentioned, or attacks of pulmonary congestion, or other causes should have so rapidly given rise to tubercular deposits as the history of this form may indicate, is not very probable. It is most likely that the tubercles, at an early and latent state of their formation, had existed previously to operation of these causes, and had been thereby developed into a rapid maturity.

82. This form of phthisis may be divided into *two varieties*; viz., that in which the more characteristic phenomena of phthisis are present in a remarkable or severe degree; and that in which these phenomena are nearly if not altogether absent; the disease being often mistaken for low nervous or typhoid fever. — *a.* In the *former* of these the patient is attacked by chills, quickness of pulse, oppressed and rapid breathing, an aching pain and anxiety in the chest and præcordia, the pain or aching extending to the spine and shoulder-blades; a short cough, which is afterwards constant and severe, with a scanty and frothy expectoration at first, which soon becomes copious and yellowish; and acute hectic fever, the pulse being very rapid and soft, the remissions slight, and the perspirations excessive, and almost continued. The sputum now is generally similar to that ushering in the second stage of the more common

form (§ 31.). The countenance is anxious, pale, covered with perspiration, the conjunctivæ clear, and the pupils dilated; the surface of the skin has a pallid or dirty hue, the tongue is dark or loaded, and the prolabia somewhat livid; the cough, oppression, and dyspnœa are so distressing as often to prevent the patient from lying down, and the breathing is short, shallow, and rapid. Hæmoptysis to a moderate extent sometimes occurs, but rarely produces relief. Vomiting takes place in rare cases. Diarrhœa occasionally appears towards the close, but is seldom severe, yet emaciation is considerable. At last the pulse can hardly be counted, and the dyspnœa is most distressing, and the cough almost suffocating. Slight delirium supervenes, the fingers and lips become livid, the nails dark and uncated, and death ensues, from four to seven or eight weeks from the attack, preceded for a few hours either by coma, or indications of impending asphyxia. On percussion a dull sound is heard over nearly all the chest. Respiration is very weak in some places and bronchial in others, and a mucous râle is generally present. No crepitation is heard, nor is the sputum characteristic of pneumonia. It is usually yellowish, is sometimes streaked with blood, or contains small clots of blood.

83. This form of the disease generally occurs in young persons. I have seen it most frequently in females, especially after measles, influenza, and hooping-cough, and the suppression of the catamenia. In these the attack has often been produced by exposure to cold; and in some cases to which I have been called the disease has been considered either as bronchitis, or as pneumonia of both lungs, both which it nearly resembles. Indeed it may be said to be very nearly allied to congestive bronchitis on the one hand, and congestive or nervous pneumonia on the other; but the previous history of the case, the scrofulous diathesis, the effects of treatment, the remarkable rapidity of breathing, the character of the sputa, and of the physical signs, indicate the difference, as well as the alliance, between these diseases, and the appearances after death fully confirm this relation (§ 132.). In 1853, a case of this kind occurred in a near relative; and, in 1854, I was called to a recently married couple, both under twenty-five years, both of the scrofulous diathesis, and viewed by the father of one of them, himself a physician, as possessing a strong tendency to phthisis. Both were attacked with measles a few weeks after their marriage; and on recovery they went to the sea-side. They resided there for a short time, and, on returning to town, were exposed to cold. The lady had had the catamenia in excess; but she had passed the usual period two or three weeks, without indications of pregnancy. Soon after her exposure she was suddenly seized by chills, oppressed breathing, cough, and the other symptoms just mentioned. The attack was viewed as congestion of both lungs. External derivatives, a moderate cupping over the sternum, followed by dry-cupping in this situation and between the shoulders, and the treatment described hereafter, were prescribed. The disease proceeded as above, and terminated fatally in about five weeks. Her husband was seized in nearly a similar manner, but not so severely, very soon after her death. During her illness he appeared pallid, depressed mentally and physically, and slightly anæmied; his pulse was very rapid and weak. He had soon afterwards a very slight short cough in the morning, no expectoration, but hurried breathing on slight exertion. He did not wish to be considered ill, and refused medicine. Immediately after his wife's funeral, and more than usual exposure, he was seized with the acute symptoms mentioned above, and in a few weeks these terminated fatally, with slight delirium and coma.

84. *b. The lesions* in this form of phthisis have been considered by Andral as those of a form of pneumonia, attacking the scrofulous diathesis, the grey tubercular granulations found after death being regarded by him as the results of inflammation of the air-cells. But the crude and more advanced tubercles formed in addition to these granulations, the quantity of tubercular matter infiltrating and consolidating portions of the lungs, the more general extension of these lesions throughout the lungs or to the lower lobes, the indications of vascular congestion of the pulmonary structures, and even of the bronchi, and the presence of some degree of œdema or serous infiltration of these structures; and still more the occasional existence of small recent cavities, partially evacuated of their contents, and without lining membranes, are evidences that the tubercular deposits, from their extent, and the sudden production of congestion of the pulmonic and bronchial tissues, had developed, more or less rapidly, a state of vascular action in these tissues, of an asthenic character, that had reacted on the tubercular deposits, and had accelerated their development; the severity and rapid fatality of the disease being occasioned by the great extent of these deposits, and by the associated changes in the lungs.

85. *c. The second variety* of acute phthisis closely simulates either nervous, remittent, or typhoid fever, according to the modifications it presents in individual cases, whilst the *first variety* closely resembles congestive or nervous pneumonia (see Lungs, Inflammations of, (§§ 62, *et seq.*) in some respects, and asthenic bronchitis of both lungs in others (see Bronchi, &c. §§ 37, *et seq.*). — This variety of acute phthisis is rarer than the preceding, and has not been noticed by those who have adopted diseases of the lungs for their speciality, the examination of the bared chest for the grand *coup* of fussy diagnosis, and the stethoscope as the baton of transcendental medical knowledge, if not of actual inspiration. This neglect is most extraordinary on the part of those who usually consider every case which comes under their view as pertaining to that region of medical science which they suppose themselves to be alone capable of cultivating. As in the preceding variety, so in this, the patient has appeared in good health, and if he have not felt this to have been the case he has not admitted it; nor have his friends detected it until he is seized by an outbreak of disorders which obliges him to keep to his bed and have recourse to medical aid. If this aid be of a proper kind, it will be found and admitted, at least in some cases, that a degree of ailment had been experienced for a considerable time before the accession of acute disease; that depression of spirits, indolence or indisposition to mental and physical exertion, debility, loss of appetite or indigestion, acceleration of breathing when ascending a height, weakness in the joints, occasional

chilliness, followed by heat in the palms of the hands or soles of the feet, especially at night, some degree of restlessness in the early part of the night, loss of colour or complexion, in some cases loss of flesh, an unusual brightness of the eyes, &c., had been present for some time, but that each or all of these were so slight as not to excite the anxiety of the patient, or they were not so manifest as to rouse the fears of his friends. The patient now feels a general prostration, has a quick pulse, with the usual symptoms of a remittent form of fever, which in a few days assumes a more continued type, the symptoms being, however, somewhat severer on alternate days. The bowels become irregular, at first confined and afterwards inordinately relaxed; the perspirations are usually abundant; the tongue is foul or loaded; the urine rather scanty and high-coloured, with copious deposits; the position in bed is on the back, with the head and shoulders more or less raised, or partially turned to either side; the features are somewhat sunk, the face pallid, and the general surface dusky, with a clammy perspiration, which is abundant over the head, face, neck, and chest; and aching or dull pains are occasionally felt about the clavicles, in the back, and under the scapulæ. During the course of these symptoms little or no cough is observed; if it be present it is commonly slight, dry, and insufficient to attract attention; but the breathing is remarkably quick, somewhat oppressed, and shallow. There is little or no expectoration, the sputum and other local symptoms being insufficient to direct attention to the state of the lungs, or to excite suspicions of the existence of rapid febrile phthisis; both cough and expectoration being apparently absent. The pulse is more and more rapid, slight or wandering delirium occurs, especially when the patient doses or falls into a waking sleep; the hair becomes thin; the surface more dusky; the emaciation very rapid and extreme; and bed sores readily form on the more prominent parts. Death soon ensues, generally in four or five weeks from the commencement of the acute attack, either from the exhaustion consequent on diarrhœa, or from coma, or sinking following delirium.

86. *d. Lesions.*—I have seen four cases of this variety of febrile consumption, to which I was called in consultation at an advanced period of their course; and at that time the symptoms and signs of phthisis, in its third stage, were more or less manifest, upon a careful and minute examination, and with due reference to the history of the case and to the health of other members of the family. In three of these an *inspection after death* was allowed, and in all several cavities were found in both lungs mostly altogether empty and nearly dry. The blood in the lungs was of a dark colour and only partially coagulated; few or no adhesions were found between the opposite surfaces of the pleura; and the lower lobes were as much diseased as the upper. The intestinal follicular glands, both solitary and aggregated, were more or less enlarged and ulcerated. Three of these cases occurred in females. The youngest was 18 years of age, the oldest of all was 27 years. It may be inferred, that the cavities, which were small, mostly empty, and the smallest only, in two or three instances, full of these usual tubercular and fluid matters, had not communicated with the bronchi, or that the bronchi in connection with them had been rendered impervious in the parietes of the cavities, from the condensation of the surrounding tissues, and that the morbid matters in these cavities had become absorbed, had contaminated the blood, and occasioned acute febrile symptoms of a typhoid or adynamic character. The circumstance of the softened tubercular matters in the cavities, and the morbid fluids flowing into them from their ulcerating parietes, not having passed into the bronchi, accounts for the absence not only of expectoration but also of cough; whilst the emptiness of the excavations shows that their contents must have been absorbed, and being carried into the blood, explains the acuteness, the rapidity, and the typhoid character of the attendant fever.

87. *C.* Consecutively Acute Phthisis is different from the two preceding varieties, chiefly as regards the character and duration of the symptoms preceding the exacerbation of the disease, and the development of the more acute and dangerous form. In these varieties the patient seems in tolerable health to those about him, and believes himself to be so, until the acute symptoms make their appearance, although the experienced observer cannot fail to remark indications of the approaching evil.—*a.* But the variety now about to be noticed is preceded by a slower and more manifest disorder of the respiratory functions than that preceding these varieties, and is in every way similar to the *latent* form of the malady, described above (§§ 77, *et seq.*), although by no means latent to any attentive observer. After pallor of the countenance, or slight indications of anæmia, with or without emaciation, debility and inactivity, mental depression, languid or soft pulse, shortness of breathing, or short cough on exertion, and sometimes after the expectoration of calcareous concretions, have continued for a very considerable or even a long time, or for several months, or even years; and generally soon after exposure to cold, or after unusual exertion, the patient experiences chills or shiverings, or a sense of cold running down the back; or he is seized with hæmoptysis, and all the acute symptoms are fully evolved. Hectic fever, at first remittent, but afterwards nearly continued; a rapid, weak pulse; very quick respiration; cough and copious expectoration; pains about the clavicles, scapulæ, or the sides, or the upper regions of the chest; colliquative perspirations, diarrhœa, rapid emaciation, aphthæ, sometimes with, but oftener without, slight delirium, ultimately supervene, and terminate life.

88. *b. The lesions* most frequently observed after death in this variety are, tubercles in various states of softening; small, or nearly cicatrised, or contracted cavities, with gritty, calcareous, or cheese-like matters in or near their centres; larger cavities, partially empty or containing blood, if hæmoptysis had preceded dissolution, and their parietes varying in appearance with their duration; condensation of the pulmonary tissue around the excavations, or congestion of portions of the lungs, and redness of the bronchial mucous membrane, &c.

89. *D.* Protracted Phthisis may commence either in the usual form, or continue for years, first in a more or less latent, and afterwards in a

manifest state. It occurs chiefly in the phlegmatic and bilious temperaments. It is often characterised by slowness of the pulse, which seldom rises above 70, and often not above 65 in a minute, by attacks of hæmoptysis, or more rarely by the expectoration of calcareous concretions; but, when the latter occurs, I have very seldom observed the former, unless in a very slight degree. It is sometimes simple or uncomplicated, but it is oftener associated in various periods of its course with one or other of the affections and lesions about to be mentioned. The nature of the disease is generally manifest; and the experienced observer will rarely fail to form a correct diagnosis, even without the aid of a physical examination, between it and bronchitis or chronic pneumonia, with either or both of which, however, it is often associated, at different periods, and even also with partial pleuritis. Percussion and auscultation are of use chiefly as showing the progressive changes and complications of the disease, although they are liable to the fallacies noticed above (§§ 35—37.), owing mainly to the states of the cavities, when they exist, and of the bronchi, arising from the presence or absence of the morbid matters that usually collect in them.

90. Several cases of very protracted phthisis have come under my notice, several of them in medical men. Dr. T. was attacked by hæmoptysis at the age of 20 when studying in Edinburgh. His circumstances having admitted of his relinquishing practice soon after entering upon it, and having experienced returns of the hæmorrhage with other pectoral symptoms, he travelled or voyaged to several parts in the West Indies, and in the south of Europe, generally passing a part of the year in one or other of these, and returning to England in the summer. Nevertheless his phthisical symptoms never left him, were exacerbated after considerable intervals, and the hæmoptysis also returned, and was sometimes alarming. This state of health continued for many years, and he continued to pass his winters in some mild climate, most frequently in that which he found to agree the best with him. At about the age of 57 or 58 he first called upon me, told me his case, and informed me that he had consulted all the consumption doctors, and that they were almost equally divided as to the existence or non-existence of cavities. I told him, after a careful examination, that there were cavities in both lungs, but that they were small, and that they most probably were filled up by the accumulated morbid secretions for a considerable time, and thus they escaped detection. He continued under my care for several years, during the periods of his residence in London or its vicinity. But the attacks of hæmoptysis were more frequent, so much so ultimately that he always carried with him pills consisting of the ergot of rye, and a bottle of turpentine. He took the former as soon as the hæmorrhage appeared, and if that failed, he had recourse, as I had directed, to the turpentine. These means generally succeeded, but the other pulmonary symptoms gradually advanced. When about the age of 67, he was seized with hæmoptysis when getting out of a railway-carriage at Paddington, had recourse to his usual remedies, and sent for me.

91. Before I reached his residence he was dead, suffocated by the hæmorrhage. The body was inspected the following day. Several cavities were found in both lungs. None of them was large. The smaller were apparently contracted: their parietes were smooth, fibro-serous, and almost fibro-cartilaginous in parts; and one or two of them so much reduced as to be almost cicatrised; the parietes being quite smooth and fibro-cartilaginous. The surrounding tissue was condensed. Some of the cavities had a membranous parietes, whilst in others the walls consisted of a somewhat condensed pulmonic tissue, with minute openings, chiefly venous or bronchial. The cavities were all filled with blood, as were also the larger bronchi, and contained but little muco-puriform matter. This case had evidently been of forty-four years' duration; and it presented appearances, as respected the cavities, of the longest and shortest duration.[*]

92. E. PHTHISIS IN INFANTS AND CHILDREN occurs chiefly in the scrofulous diathesis, or as a consequence of protracted or neglected disorder of the digestive and assimilating functions, which in children may generate both the scrofulous diathesis and tubercular disease. Disorder of these functions may in all temperaments so affect the circulating fluids as to develop that habit of body, in early life, which constitutes the scrofulous diathesis, and which, in its more manifest states, implicates not merely the lungs, but other organs also. When treating of *Scrofula* and *Tubercles*, I have shown that the scrofulous diathesis may either be inherited or generated by the parent, and by the offspring in childhood, by causes which depress or exhaust organic nervous power—impaired digestion and assimilation of the hæmatosine, and imperfect nutrition resulting therefrom—and thus engrafting scrofula and tuberculosis upon any temperament. It is therefore most important that this disorder of the digestive and assimilating functions in childhood should be recognised and traced to its causes, and that these causes should be removed.

93. The aspect of children thus affected suggests the idea of imperfect organic power. The child is languid or fretful; the flesh is flaccid; the skin harsh, dry, and unhealthy to the sight and touch. It is disinclined to play or to active exer-

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[*] Dr. W. H., who had been Editor of the "London Medical and Physical Journal" in the years 1819, 1820, and 1821, in 1823 evinced indications of pulmonary disease, and in the following year he had a most severe attack of hæmoptysis. He came under my care, and I advised him to pass the following winter at Naples. He returned to England in June, but was more or less of an invalid all the summer and autumn. He went to the coast of Devonshire the next winter; and he thus continued to change his place of residence for many years, often returning to London or its vicinity during portions of the summer and autumn. The pulmonary symptoms were sometimes slight, at other times severe. He died about 25 years after his first attack, in the vicinity of London. The treatment of this case, and of Dr. T.'s, was conformable with that which I shall have to recommend in the sequel.

Miss L. came under my care about nine years ago, in the third stage of phthisis. The symptoms and signs of cavities in the lungs had previously been recognised by the physicians whom she had previously consulted. When I saw her these were unmistakeable. During the years which have intervened since my first visit, she has experienced intercurrent attacks of bronchitis, of partial pleuritis, &c., which have been successively overcome; and during the severe winter and spring of 1855 she was not confined a day to her apartment, and but rarely to the house. The physical signs and chief symptoms of cavities in the lungs still exist. I could adduce numerous other instances of the protracted form of this disease, if it were necessary to do so.

cise. The face is pale, pasty, or faded. The eyes appear large; the pupils are dilated, and the conjunctivæ white. The tongue is whitish, and dotted with small red points, the extremity and sides being red, and the root and centre loaded, or more or less furred, especially in the morning. The appetite is variable, often craving or unnatural; thirst is not infrequent, and the breath is fœtid. The bowels are irregular, most frequently costive, but sometimes very loose; and the evacuations are offensive, often pale, greyish or clayey: occasionally mucus and imperfectly digested food are observed in the stools. The urine is either high-coloured at times, scanty or abundant, turbid or pale. The extremities are usually cold; and sleep is disturbed, and often followed by partial night-sweats. The child often talks when asleep, or grinds his teeth; and hence the complaint is often ascribed to intestinal worms, with which, however, it is not infrequently complicated.

94. If the complaint continue, the symptoms are not only increased, but others are superadded. The countenance is more faded and pasty; the upper lip is thick, tumid, or fissured; the throat and fauces red or sore, or the tonsils enlarged; the eyelids and tarsi are inflamed, or the pupils are dilated, the conjunctivæ pale or pearly; the nostrils are somewhat swollen or sore, or discharge a thick mucus; and mucus, mixed occasionally with blood, is passed from the bowels with frequent offensive and griping motions. These symptoms may continue for some time, the flabbiness and emaciation increasing, and becoming associated with quick respiration, cough, and mucous expectoration, occasionally streaked with a little blood. The skin is harsh and dry, but sweats break out during the night; languor and debility increase; the pulse and respiration are greatly accelerated, and the quickness of the latter relatively to the former increased. The pulmonic symptoms become, in most cases, more manifest, but vary much with the age and temperament, or habit of body, of the child. In the very young, they are often marked by disorder of the bowels, which frequently appears urgent, and is more or less connected with tubercular deposits in the mesenteric glands. In others, the great size of the head and the emaciated state of the limbs lead to the suspicion of incipient disease of the brain or its membranes, which indeed may be actually commencing, either as softening of the central parts of the organ, or as tubercular formations in the membranes; but these changes, as well as those in the mesenteric glands, may be contemporaneous with tubercular deposits in the lungs also, the amount of disease in this organ either predominating or advancing *pari passu* with that in the others. In many, especially the very young, the pulmonary tubercles never reach the stage of dissolution and tubercular vomicæ, the disease of the brain, or of the mesenteric glands and bowels, or the extent of tubercular infiltration of the lungs, even of the lower as well as of the upper lobes, terminating life before this stage is approached or advanced, although the emaciation, and the oppression and acceleration of breathing, are extreme.

95. In these cases the cough and expectoration may be slight; but the dulness on *percussion*, and impaired motion of the ribs, are generally remarkable. The other *physical signs* are nearly the same as stated above in respect of the early stage of phthisis (§§ 24, *et seq.*); but those of percussion are more to be depended on than of auscultation, especially in young children; and, in those particularly, hæmoptysis rarely occurs, unless at an early period, and then as merely streaking the expectoration: but slight epistaxis is sometimes observed. The younger also the child, the more general are the tubercular deposits in the several organs, especially in the lungs, in the bronchial glands, in the mesenteric glands, membranes of the brain, &c.

96. *F.* THE DARK RACES are much more exempt from phthisis than the white; but very much depends upon race, and upon continued residence in the same or similar climate, on the one hand, and migration to a colder climate, on the other. Of the degree of prevalence of this malady in different races, some notice, although insufficient, will be taken in the sequel; and I can here only mention the much greater prevalence of this malady in these races, especially the negro race, when they migrate to a temperate, or a cold or changeable climate. As to the usual course of the disease, when it attacks individuals of either a black, brown, or copper-coloured race, I am not enabled to speak with confidence; but, from what I have seen, it commences silently and insidiously, and advances more and more openly and rapidly to its fatal issue. In some cases the attack appears as a vital blight, by which the lungs are especially affected; a lower range of temperature or greater exposure than heretofore experienced, or other depressing or exhausting causes, whilst they impair organic nervous power, and the assimilating functions, thereby develop tubercular deposits in the lungs, as the parts most predisposed, by structure and exposure, to experience this morbid change, generally without any inflammatory precursors or complications. These races, as far as I have had occasion to observe, rarely or never present the protracted and very chronic states of the malady sometimes seen in the white races; whilst the more rapid or acute forms are frequently met with, but these generally with fewer indications of febrile or excited vascular action than in the white races. Hæmoptysis is, I believe, less frequently observed as a symptom or complication of the disease in the negro than in the latter races, whilst it is a severe and frequent symptom in the mixed races of South America.*

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* DR. ARCHIBALD SMITH, in a very interesting *account of the Diseases of Peru*, states that "in Spring, a season when many severe cases of pneumonia present themselves, the commonest catarrh generally appears under a more febrile form, and when it unfortunately affects one of a consumptive tendency, it is frequently the exciting cause of a galloping decay. For at this season it is remarked that consumptive patients, with which the hospitals in Lima are well supplied, die very speedily, while at other seasons they linger on for a longer period. Persons who are habitually subject to chronic *bronchitis*, and troubled with what they call crude phlegm, or much mucous expectoration, are apt to fall into a fatal decay, as a consequence of an acute attack originating in cold; and others, who have been in a lingering state of health for some time, with a slow fever and a short dry cough, or a cough accompanied with expectoration, especially in the morning, of clear and frothy sputa, are prone to have their fever increased, and to be hurried into a state of catarrhal consumption. In cases of the latter kind, it is probable that tubercles may have previously existed in the lungs, and that the exception of catarrh only serves to bring phthisis into more decided action. And, indeed, it may be made a question whether those cases of chronic bronchitis to

97. iv. **The States of the Blood in Phthisis.** — Before a precise idea can be formed of the states of the blood in this disease, the healthy conditions of the blood should be considered, with reference to *sex*, *age*, and *temperament*, in order that the degrees in which the former differ from the latter may be seen. It should not, however, be overlooked, that the *chemical analyses* of Denis, Lecanu, Becquerel, Rodier, Andral, Nasse, Gavarret, Simon, &c., have presented slight differences, even at the same age, in the composition of the blood in health, so that the results at which they have arrived may be viewed rather as a close approximation to the truth than as absolute certainty. In addition to the differences arising from sex, age, and temperament, others, hitherto not inquired for, may also exist, especially those depending upon race, climate, and season. After examining the mean results furnished by the above writers, I here give those assigned by Becquerel and Rodier, as the most precise and as nearly approaching the mean of the other observers.

98. *a.* The following table, containing the mean of a number of analyses of the blood of *healthy* persons, between the ages of 21 and 55 years, shows the differences between the constituents of this fluid in *males* and *females*, in 1000 grains, or parts.

	Male.	Female.
Density of defibrinated blood	1060·0	1057·5
Density of serum - -	1028·0	1027·4
Water - - - - -	779·0	791·1
Fibrin - - - - -	2·2	2·2
Sum of fatty matters - -	1·60	1·62
serolin - - -	0·02	0·02
phosphorised fat -	0·488	0·464
cholestrin - -	0·088	0·090
saponified fat -	1·004	1·046
Albumen - - - -	69·4	70·5
Blood corpuscles - -	141·1	127·2
Extractive matters and salts	6·8	7·4
chloride of sodium	3·1	3·9
other soluble salts	2·5	2·9
earthy phosphates	0·334	0·354
iron - - -	0·566	0·541

99. *b.* The differences of the constituents of the blood at different *ages* have not been determined with sufficient precision; but according to the researches of Denis, the water in the blood is somewhat increased after 50 *years* of age, the solid residue slightly less, the blood-corpuscles are materially diminished, and the albumen nearly the same in quantity. In *childhood*, the water is increased, the solid residue somewhat less, the blood-corpuscles considerably less than at mature age, and the albumen nearly the same as at that age. Becquerel and Rodier state that, after 40 or 50 years of age, there is a decided and progressive increase of cholestrin in the blood. As puberty approaches and as the generative organs are developed, the blood-corpuscles and iron increase, and the relative proportion of water diminishes; the corpuscles and iron serve to maintain the energy of these organs; and until the powers of these organs begin to flag, the blood experiences little or no diminution of its red corpuscles.

100. *c.* The *constitution* has considerable influence on the state of the blood. At equal ages, the solid constituents and hæmato-globulin are less abundant in the blood in weak than in strong constitutions. According to Lecanu and others, the blood of persons of *lymphatic* and *phlegmatic temperaments* is much poorer in solid constituents, and especially in red globules, than that of persons of sanguineous temperament; the quantity of albumen being the same in all. The following are the results in 1000 parts:—

	Sanguineous Temperament.		*Lymphatic and Phlegmatic Temperament.*	
	Men.	Women.	Men.	Women.
Water - - -	786·584	793·007	800·566	803·710
Albumen - - -	65·850	71·264	71·781	68·660
Blood Corpuscles -	136·497	126·174	116·667	117·300

101. *d.* The *chemical analysis* of the blood in threatened and incipient phthisis furnishes the same

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which I have referred may not, sometimes at least, be instances of bronchial irritation, and consequent expectoration of a mucous secretion, sustained by the presence of tubercles. Whatever be the particular form or primary character of pulmonary consumption, certain states of the atmosphere, depending on different degrees of altitude, appear to be either hostile or favourable to its existence or development, according to the particular locality in which the patient happens to reside. Thus on the coast it is a common disease, terminating in purulent expectoration and death, in whatever way it may have originated; but, on the intermedial mountains, and in the temperate valleys of the interior, pulmonary consumption is a rare malady.

"A failure of strength and health coming on gradually, or as it were by stealth, with impaired appetite, a slight dry cough, with or without pain at the breast or shoulders, a febrile pulse, with nocturnal heat and restlessness, are symptoms frequently precursory of those which characterise confirmed consumption. This slow fever, so much dreaded by every one as the harbinger of phthisis pulmonalis, and often aggravated by daily provocations, or fretfulness and anger, is always accompanied, if not always preceded, by a diseased condition of the digestive functions. This affection is, I think, well described by Tissot as a disease to which men of letters are subject:—"This slight fever, to which some men of letters are liable, and which, by impairing the nutritious lymph, renders them pale and thin, and throws them at last into a state of decay and consumption, a fever which itself depends on this, that sometimes a strong mental emotion excites the action of the heart and accelerates its pulsations; but more frequently it arises from bad digestion, and a faulty condition of the chyle, which irritates the organs of circulation, and so becomes the cause of the fever; and, also, if the organs of respiration are delicate and sensible, of a cough, which, united to the fever, may degenerate into hectic fever and phthisis.—*De la Santé de Gens des Lettres*, p. 33. In conformity with these views, which are as applicable to the ordinary cases of incipient phthisis in Lima, as to the explanation of the origin of pulmonary affections in men of letters, according to Tissot, I would remark that the chests of the Limenos, especially the male part of the white population, are commonly contracted; very rarely open and spacious, except among the dark and labouring classes; and every practitioner entrusted with the medical treatment of these people should constantly bear in mind that their respiratory organs are so delicate and easily affected, that sometimes shaving and washing the face in cold water bring on catarrh; and I have already shown how this latter affection may be the precursor of confirmed consumption."—*Edinburgh Medical and Surgical Journal*, vol. liv., pp. 6—9.

Dr. A. Smith has here shown the very intimate connection of phthisis with impaired digestion and assimilation, and the want of originality, as well as the limited views of those writers who, since the days of Tissot, have espoused a somewhat similar doctrine. Of *hæmoptysis*, in connection with phthisis in Peru, Dr. A. Smith remarks:—"Spitting of blood from the lungs is exceedingly common in Lima, and not confined to persons of any particular class or colour, though more prevalent among the fairer inhabitants of European descent;" and he points out the frequency of attacks of hæmoptysis, not only as a prelude, but as an attendant upon the early stages of consumption amongst the several races peopling Peru.

results as those stated in the Article on Scrofula and Tuberculosis (§§ 93, *et seq.*). When phthisis is further advanced, the changes in the blood are more and more manifest. Andral and Gavarret state that, in all periods of the disease, excepting the last, the fibrine seems on the increase, and the red corpuscles are on the decrease, progressively throughout; but that the proportion of the increase on the one hand, and decrease on the other, varies with the progress of the malady. If the tubercles be in a crude, unsoftened state, the increase of fibrine is only small, and its whole amount may be estimated at about 4. This, however, according to the researches of Dr. Fricke, of Baltimore, and others, is too high an estimate. The decrease in the corpuscles in this stage is perceptible, but not very great. As the tubercles soften, the quantity of fibrine slightly increases, and the corpuscles decrease. Upon the formation of vomicæ, or cavities in the lungs, the fibrine is somewhat further increased — to 5·5 according to Andral — but it never reaches the amount observed in pneumonia. The results vary, however, with the nature of the associated lesions, which most of chemical observers have not taken into the account; for the occurrence of severe attacks of hæmoptysis, or of partial, sub-acute, or chronic pneumonia, or pleuritis, or peripneumonia, will increase the fibrine and greatly diminish the red globules. In the last stage of phthisis the blood becomes still poorer; the fibrine decreases in nearly the same ratio as the other solid constituents, and even often falls below the healthy standard. The following table furnishes the results of 22 anslyses by Andral and Gavarret, and 9 by Becquerel and Rodier, in 1000 parts, of the blood in phthisis :—

	In Men.			*In Women*	*By Andral & Gavarret.*
	1st Vene-sect.	2d Vene-sect.	3d Vene-sect.		
Water - -	791·4	799·8	821·0	796·8	809·7
Solid Constit. -	205·2	200·2	179·0	203·2	190·3
Fibrine - -	4·8	4·2	3·6	4·0	4·4
Fat - - -	1·55	1·44	1·06	1·729	
Albumen - -	66·2	65·0	62·0	70·5	
Blood Corpuscles	125·0	122·7	103·5	119·4	100·5
Extractive Matter and Salts	7·7	6·7	8·9	7·6	

102. Mr. Ancell has adduced the results of a great number of researches into the constitution of the blood in phthisis. He views the disease to derive its origin from morbid states of the blood. The chief differences existing between the views of that gentleman and those entertained by me, as stated under the head Scrofula and Tubercles (§§ 101, 102.), are, that I cônsider the changes observed in the blood, the nature and extent of which I fully admit and describe, not as the origin of tuberculosis, but as effects of originally deficient, or consecutively impaired, power of the organic nervous system — of that system which endows the digestive, assimilating, circulating, and nutritive organs — defective assimilation of the chyle, and an unhealthy condition of the blood, being the consequences of this state of the organic nervous system, and only intermediate links in the chain of pathological results, the extremities of which chain are the state now assigned and the tubercular lesions.

103. *e.* I may adduce the following as the results of my own observations of the state of the blood in the early and in the advanced stages of Phthisis : — At an early period, or even before the disease has fully declared itself, the blood is thinner or poorer than in health ; the colourless globules are more or less abundant, and the red globules less numerous ; the clot is somewhat smaller, its crasis less, and it sooner loses its cohesion. As the disease advances, and as febrile action is established, the fibrin is somewhat increased, and this is more certainly the case, if hæmoptysis, or intercurrent inflammations of any of the pulmonary structures, take place ; the red globules are diminished, and the albumen and fatty matter are not very materially changed in quantity. The alkaline salts are slightly deficient, and lime is somewhat in excess. It should not, however, be overlooked, that, among the numerous analyses of the blood in phthisis, there are very great differences in the quantity of fibrin, of albumen, and of fatty matter. I have here given what appears to be the more correct results. Probably the quantity of each of these is not so different as the quality, the intimate constitution, and vital relations. In the last stage of the disease, the blood appears still more watery, owing chiefly to the deficiency of red globules : and the colourless globules more numerous than in health. The greater abundance of côlourless globules is probably owing to impaired assimilation, or metamorphosis, of these into red globules. The colourless globules in this, and indeed in earlier stages of the disease, have been mistaken for pus globules, the existence of which in the circulation is doubtful, or at least not satisfactorily demonstrated. The vital crasis, as well as the size of the clot, progressively diminishes. It does not appear that the *microscopic appearances* of the blood in phthisis are different from those now stated, or that the observations which have been made with the aid of this instrument have furnished any additional facts to those now adduced. (See Art. Scrofula and Tubercles, §§ 93, 94.)

104. v. Complications of Tubercular Phthisis.—It is manifest that tubercles in the lungs, in their several states and stages, being the effects (as shown in the art. Scrofula and Tubercles, §§ 101, 102.) of originally deficient, or subsequently impaired, organic nervous power, and of the consequent changes in the blood, should not be viewed as a special disease of the lungs, or as limited to these organs only, but as a malady, in which the constitution — the whole frame, is more or less implicated. The earlier changes of organic nervous power and of the circulating fluids being such as now stated, it may be inferred that numerous associated and consecutive alterations will appear at early and advanced stages of the malady, more or less intimately connected with the original mischief, or tubercular vice, either as associated or related changes, or as more remote results. As these severally, and often in various associations, may be expected to present themselves in the course of phthisis, it becomes important that a brief view should be taken of them, as they are most frequently presented to us in actual practice, and nearly in the order as to frequency in which they occur.

105. It will appear from the foregoing, as well as from the circumstance of my not having taken

particular notice of a form of phthisis, recently called *dyspeptic phthisis*,—a form which Dr. A. Smith has shown above (*see note to* § 96.) to have been first insisted on by Tissot,—that I do not consider this as a variety of phthisis, inasmuch as digestion is, as noticed by Dr. Smith, an early attendant upon all the forms of this malady, although in different grades; and even when dyspepsia may be so slight as to be overlooked, especially as regards the functions of the stomach, healthy assimilation and nutrition may be very remarkably impaired. Original or acquired defect of the digestive, assimilating, and nutritive functions is not only the attendant upon the commencement and progress of the several forms of phthisis, but it precedes their origins in more or less manifest grades. Indeed, the malady may rationally be viewed as presenting this procession of morbid phenomena, if we admit the earliest change from health in tubercular persons, whether hereditary or acquired, to be impaired function of the ganglial nervous system, or, in other words, defective organic nervous power—a power which endows and actuates the digestive, circulating, and nutritive organs and functions.

106. *A.* Hæmoptysis.—I have already considered this occurrence as a symptom of phthisis (§§ 49, *et seq.*). It may also be viewed as a *complication* of this disease; and it may supervene upon tubercles of the lungs coexisting with either functional and congestive disorder, or with organic lesion, of the heart. Hæmoptysis may, however, be caused by congestion of, or impeded circulation through, the cavities of the heart, independently of the existence of tubercles in the lungs; but this occurrence is comparatively rare. The blood may proceed — 1st. as a simple exudation from the bronchial mucous membrane, in consequence of the irritation and congestion caused by the tubercular deposits, whether within or without the air-cells and capillary bronchi, and by the impediment they occasion to the circulation in the pulmonary veins;—2dly, from the surface of a cavity owing to the erosion of one or more of the vessels passing to it,—a circumstance of much more frequent occurrence than was formerly supposed; — 3dly, into the structure of the organ, without any previous cavity, little or even none of the blood being expectorated, asphyxia having been suddenly produced by the extravasation (see § 134, and art. Lungs, §§ 186, *et seq.*).

107. The hæmoptysis which takes place at the commencement or at an early stage of phthisis may generally be ascribed to the first of these pathological states; but it may also proceed from the disorders and lesions of the heart already alluded to (§ 51.), either independently of, or in connection with, tubercular deposits in the lungs. It should not, however, be overlooked that the hæmoptysis may appear in females as a vicarious menstruation: and as such it may be connected with tubercular deposits in the lungs or morbid states of the heart, or with both states of disease, or it may be independent of either of these. When the hæmoptysis takes place vicariously of menstruation, the lungs are very rarely free from tubercular formations. But, in whatever mode hæmoptysis takes place, the blood, which remains for a time in the bronchi, from or into which it is effused, generally excites more or less irritation, often amounting to inflammation of the bronchial mucous surface, thereby further complicating the malady. (See art. Hæmorrhage *from the respiratory organs*, §§ 96, *et seq.*)

108. *B.* Bronchial Irritation and Inflammation.—Bronchitis, most frequently limited, but either acute, sub-acute, or chronic, is a common complication of phthisis. It may exist in one or other of these states. It is generally confined to the bronchi in a portion of one or both lungs, and more especially to the bronchi in the vicinity of, or communicating with the seats of tubercular deposits or cavities. In the first stage of phthisis, these deposits most probably occasion merely a state of irritation, or of sub-inflammation, of the mucous membrane of the adjoining bronchi; but, even in this stage, when external agents, or other causes, aid the operation of this pathological condition, then a more active disease of this membrane is developed, especially if one or more attacks of hæmoptysis have occurred, and sub-acute or even acute bronchitis results. The effect of this bronchitis, although limited, as now stated, is to develope the crude tubercles and to hasten their softening. When this has taken place, and the softened tubercular matter has made its way into the adjoining bronchi, then a very obvious cause of irritation and of inflammatory action is superadded to those previously existing. Hence during, and subsequent to, the softening—during the second and third stages, the sputum becomes much more abundant, and its quantity is owing chiefly to the morbid secretion from the inflamed bronchi—unless, indeed, in those very rare cases, when the bronchi is not materially irritated by the disseminated tubercles, or when the softened matter is absorbed and does not pass off by the bronchi. In these stages, the discharge from the surface of the cavities, or the contents of recent tubercular vomicæ, are the chief causes of the bronchitis and of its perpetuation; for it is frequently observed, that the morbid appearances, both inflammatory and ulcerative, exist chiefly in, or are limited to, the bronchi communicating with the vomicæ or cavities, and that these changes may be traced in, and from, these bronchi to their larger trunks, until the trachea is reached, where also, as well as in the larynx, the same alterations are not infrequently observed (§§ 109, 110.); whilst the bronchi which present not this communication, or which extend only to crude tubercles, are either exempt from these changes or present them in a slight degree. Dr. Carswell detected ulceration even in the minute bronchi communicating with cavities, showing the extension of the morbid action from the latter by means of the discharge from them.

109. *C.* Inflammation, Ulceration, Œdema, &c., of the Larynx and Trachea are often complications in the course of phthisis. The frequency of this association depends upon the original, concurrent, and consecutive causes, and upon influences and agents acting in the course of the malady. The affection of these parts is to be imputed chiefly to the same changes as occasion the bronchitis—to the tubercular and other discharges from the originally diseased parts; and often the morbid appearances may be traced from the bronchi communicating with cavities to the trachea and larynx. In some cases, however, the affection of the larynx, and even of the epiglottis, commences previously to the softening of the

tubercles, and may be ascribed in these to the greater susceptibility of these parts, in the early stages of phthisis, to the usual exciting causes of inflammation and its consequences, and to the irritation extending to them,—by sympathy and continuity from the pulmonary and digestive mucous surfaces. In the early, as well as in the advanced, stages of phthisis, the digestive mucous surface furnishes many indications of irritation, giving rise to heart-burn, acrid eructations, &c., which very sensibly affect the larynx and epiglottis, and kindle disorder, which is not readily, and even never, put out. That it may thus partly originate in the digestive organs, is shown by the circumstance of the lesions being sometimes either limited to the larynx and laryngeal surface of the epiglottis, or chiefly found in these parts, the trachea being comparatively exempt or nearly so. In other cases, both these and the trachea are affected more or less; and not infrequently the inflammatory changes, ulcerative, &c., are limited to the trachea, and found chiefly either in the posterior or membranous portion of the trachea, or towards the side of it corresponding with the cavities which exist chiefly or only in one lung. This limitation of the ulceration to one side of the trachea, very probably is caused by the passage of the morbid secretion over it during the position of the patient in bed, which is most frequently on the back, or towards the side most diseased, so as to give greater freedom of respiration to the lung least affected. In some cases, the ulceration of the posterior part of the trachea is very extensive, and some of the ulcers very deep, even so much so as to give rise, in rare instances, to a fistulous opening into the œsophagus, one instance of which came under my observation. (See art. Larynx and Trachea.) The larynx is rarely attacked primarily, or independently of tubercular deposits in the lungs; it is chiefly in connection with tubercular disease of the lungs and with syphilis that lesions of this part occur. M. Louis states that of 180 persons, who died of chronic diseases, not phthisical or syphilitic, he found one only with ulceration of the larynx; but that one in five had ulceration of this part or of the epiglottis; and one in three had ulceration of the trachea, among those who died of tubercular consumption.

110. *Inflammation* or ulceration of the larynx is an important complication of phthisis; and when the affection of these parts is severe, and that of the lungs not well developed, or at an early stage, the disease has often been called *laryngeal phthisis*. But, in those cases, the affection of the larynx is merely symptomatic of the tubercular formations in the lungs, which is often masked by the former affection, especially when it is severe or the tubercular deposits not far advanced. In this state of the larynx there is either hoarseness or loss of voice, with pain in the region of the os hyoïdes, especially when ulcerations have advanced. The cough is characterised by a harsh grating sound. It is difficult, suffocative, or attended by a whistling noise. The *ulcerations* in the trachea are very frequent in the more chronic states of phthisis, and are rarely manifested during life in these slow cases. M. Louis observed in some instances that sensations of heat and obstruction were complained of behind and above the sternum.

111. *D.* Inflammations of the Lungs, *limited to portions of them, and both of these portions and of their bronchi*, especially to parts adjoining the tubercular masses, vomicæ and cavities, often occur at all stages of phthisis. In the first stage, when the tubercles are crude or disseminated through the organ, the inflammatory action may, from its grade, or its congestive or scrofulous character, or from being masked by the tubercular deposits, be imperfectly manifested either by the rational symptoms or the physical signs. In this stage it is very difficult to determine whether the tubercles be the cause of the inflammatory irritation, or the latter the produce of the tubercles. It is not improbable that, however originating, the one morbid state acts, and is acted, on by the other. As the tubercles advance to softening inflammatory or congestive appearances may be detected around them, and the same are often seen around the vomicæ or in or near the walls of cavities, the bronchi, both capillary and large, participating in these changes. In many instances the structure of the lungs is condensed or infiltrated with tubercular matter around cavities or vomicæ, the change being a result of inflammation of a scrofulous or congestive character, limited to the situations in which the tubercular deposits are, or have been, most abundant or developed. In other instances, especially at an early stage, the attacks of Hæmoptysis, especially when considerable, diminish or subdue the inflammatory condition, and leave the portions of lung not yet disorganised in a better state than previously for the performance of their functions. In some cases, especially where the deposits or vomicæ are near the surface of a portion of lung, the inflammatory action in the adjoining structure extends to the pleura, giving origin to the next complication, namely, intercurrent *pleuritis*, which is very frequently associated with one or more of those already considered.

112. *E.* Inflammation of the Pleura—in an acute, sub-acute, or chronic form—most frequently limited, but sometimes very considerably extended—generally very sensibly expressed, but occasionally almost latent or not expressed, or rather overlooked during life, is a most common lesion in cases of tubercular consumption; for it is very rarely found on dissection that the lungs in this disease are altogether free from old or recent adhesions. The pleuritic lesion usually arises as just stated, and is in most cases manifested by the pain commonly experienced, and if not by pain, by the physical signs. The inflammation of the portion of pleura covering tubercular deposits or vomicæ agglutinates it, by the exudation of lymph, to the opposite or costal pleura, thereby preventing, unless in rare instances, the *perforation* of the pulmonary pleura, and the consequences which would follow. The lesions supervening in the pleura in the course of tubercular phthisis, and the contingent results which sometimes ensue, more especially *perforation of the pulmonary pleura*, are fully considered under the heads Pleura, *inflammations of* (§§ 112, *et seq.*), and *structural Lesions of* (§§ 201, *et seq.*), and Pneumatohorax, and to these I refer the reader for the further elucidation of these complications of phthisis.

113. *F.* Several Abdominal Complications are manifested in the course of phthisis, and evince the general or constitutional nature of the malady—or the origin of it in the organic or ganglial

nervous influence endowing the vascular system and the circulating fluids. These complications may appear at all stages of phthisis, or they even may precede the first stage.—*a.* The complication with *disease of the digestive mucous surface* is one of the most important. The stomach, the lower parts of the ileum, and the cæcum and colon, are most frequently affected. M. Andral justly remarks that "softening of the mucous membrane of the stomach, hyperæmia of the different portions of the intestines, ulceration of the small intestine, accompanied in many instances by a development of tubercles, are all of such frequent occurrence in phthisis, that they may fairly be considered as constituent parts of the disease." These lesions of the digestive canal most frequently occur in the course of the pulmonary disease, often not until an advanced stage, especially in persons somewhat advanced in age; but they sometimes precede it, particularly in children and younger subjects; and, in some cases, the pulmonary and abdominal affections appear to commence at the same time or nearly so.

114. (*a.*) This is more especially the case as respects the complication with *disorder of the stomach.* At the commencement of phthisis this complication is usually of a dyspeptic character; but it may, as the disease advances, or even from the first, assume a severer form and be attended by nausea, pain, or vomiting. Tenderness, a sense of heat or burning pain, increased by pressure, are present in these cases, and may arise either from inflammatory softening of the villous surface, or from ulceration. These symptoms and lesions, although early observed in some cases, the vomiting and pain occasionally being severe and obstinate, commonly appear in the second or third stages of phthisis—oftener in the third. As far as my experience extends, young females have more frequently presented this association than males. *Increased size of the stomach* was observed by M. Louis in more than two-thirds of the cases examined by him after death, whilst only two instances of it were seen in 230 subjects who died of other diseases. In some cases the organ is double or treble its natural capacity, descending in these as low as nearly to reach the pelvis, its coats becoming thinner in the ratio of its increased size.

115. (*b.*) *Disease of the intestines,* chiefly of the follicles of the lower portion of the ileum, commencing with tubercular deposits in the solitary and agminated follicles, and terminating in ulceration of these, is a very common complication of phthisis. The follicles are first distended, enlarged, and projected on the mucous surface by the tubercular deposit; they afterwards burst, discharge their contents, and ulcerate; the ulcers being seated chiefly in the patches of agminated follicles in the lower portion of the ileum, and in the side opposite to the attachment of the mesentery. In the large intestines, especially the cæcum, the ulcerations are disseminated irregularly. The small ulcers in the ileum generally coalesce, and the ulcers often pass under the mucous surface and detach portions of it. They often proceed deeply, as shown in the article on the Digestive Mucous Surface (§§ 36, *et seq.*), but they rarely perforate the intestines in phthisis, for as soon as they approach the peritoneal surface, lymph is thrown out on it, and the nearly perforated part is agglutinated to the opposite peritoneal surface. This lesion of the intestines is generally attended by the obstinate diarrhœa which occurs in the second and third stages of phthisis, in the latter especially, and has usually been termed *colliquative diarrhœa.* It is chiefly to be ascribed to two morbid conditions, or to either of them, namely to the existence of tubercles in the intestinal follicles, or to disease of these follicles excited by the morbid states of the blood, in the course of the elimination of the morbid elements from this fluid by these follicles.

116. The earlier the ulceration of the intestines takes place in phthisis, the more rapid in general is the progress of the malady, and the loss of flesh and strength of the patient. In the more chronic and protracted cases, this lesion seldom supervenes until shortly before their fatal termination. M. Louis states, that he found tuberculous ulceration of the small intestines in five-sixths of the cases he inspected; and almost as frequently in the large intestines; the mucous membrane being often red, thickened and softened in about one-half of these cases. In the whole number of phthisical bodies examined by this physician, the large intestines were in a healthy state throughout their extent in three instances only. In the cases which I have inspected, I have always found the *cæcum* more or less ulcerated; and in some I had reason to infer that this portion of the canal was the first to be affected; perforation of the cæcum and pericæcal abscess or fistula having taken place in two cases in which I was consulted.

117. (*c.*) The *mesenteric glands* are often found tuberculous, especially in young subjects, and in connection with tubercular ulceration of the intestinal follicles. In the phthisis of very young children these glands are rarely exempt. Papavoine says that he found this lesion in one half of the cases of phthisis in children. This proportion is less than I have remarked in this class of subjects. In adults, Louis found these glands tuberculous in one-fourth only.

118. (*d.*) The *liver* is found remarkably changed in a very large proportion of phthisical cases. This change consists in the deposition of *fat* in its structure, this organ becoming enlarged, fawn-coloured, and of diminished consistence, in proportion to the amount of fatty degeneration. The fatty or oily nature of this change is at once shown by the scalpel on dividing the liver, or by pressing a portion of it on paper, or by subjecting it to heat. The organ is equally changed throughout, and with a rapidity nearly equal to that of the tubercular malady, with which this alteration is intimately connected, and upon which it is dependent. M. Louis states that of 49 cases of this degeneration, 47 occurred in tubercular phthisis; whilst of 230 subjects of other diseases, nine only presented this alteration of the liver, and seven of these had tubercles in the lungs. He further remarks, that it is independent of the patient's age, and of any known cause excepting the existence of tubercles; and that it is not attended by any evident symptom except enlargement, the functions of the organ not being disturbed. Sex appears to influence its occurrence, as of the forty-nine cases seen by Louis, only ten were males. The most remarkable instances of this alteration in connection with phthisis which I have seen, occurred in females addicted to the abuse of spirituous liquors. In a young female who was thus addicted

from childhood, who had never menstruated, and had died of phthisis about the age of nineteen, the fatty, fawn-coloured liver was so remarkably enlarged as to fill the abdomen, the lower edge of it pressing upon the bladder and pelvic viscera, the organ nearly equalling in weight the whole body. In these cases tubercles are rarely found in the liver, unless in children. From my own observation, and from a remark made by Sir J. CLARK, this change of the liver is not so frequently seen in phthisical subjects in this country as in France, yet functional disorder of this organ is often observed in the course of phthisis.

119. *G. Various other lesions* take place, especially in the advanced course of phthisis, but these are merely contingent occurrences, and seldom, or even rarely, met with. The most important of these are lesions of the heart, in rare cases, occasioning sudden death in the course of phthisis; obstruction of veins from coagula in their canals; hæmorrhoids and fistula in ano; tubercular and granular lesions of the urinary organs, and disease of the sexual organs. These require merely a few passing remarks.—*a. Softening and slight dilatation* of the ventricles is sometimes observed in the course of phthisis. In the case of a lady, death took place suddenly in the second stage of the chronic form. The body was examined in my presence, and the only apparent cause of the sudden dissolution was this alteration of the heart. I have, however, seen this change in other cases of phthisis; but, although it may have accelerated the course of the malady, sudden death has not appeared to have been caused by it.

120. *b. Coagula in venous trunks*, especially in the extremities, form in rare cases at an advanced stage of phthisis, occasioning great œdematous swelling of the limb; and are the results of the morbid state of the blood, and of impeded circulation in the venous trunks rather than of inflammation of these vessels.

121. *c. Hæmorrhoids* are occasionally a complication of phthisis, and are produced as much by one of the most frequent causes of the latter, as by irritation of the rectum by frequent action of the bowels, and by interrupted or impeded circulation in the portal vessels, namely, by masturbation, which determines the circulation to the structures in the vicinity of the anus, and which, with one of its consequences, constipation of the bowels, favours congestion of the hæmorrhoidal veins.

122. *d. Fistula in Ano* sometimes occurs in the course of phthisis, more frequently in the early stages. It may be imputed to the same causes as produce hæmorrhoids. It has the effect of prolonging the duration, or to a certain extent arresting for some time, the progress of phthisis. Hæmorrhoids, when they discharge at intervals, have a similar effect to fistula in ano on the progress of the disease, as I have observed in several cases.

123. *e.* Alterations, more particularly tuberculosis, of the *urinary* and *sexual* organs, seldom supervene, in the course of phthisis, although the functions of these organs, especially of the uterine organs, are more or less disordered. Tubercular formations are sometimes formed beneath the mucous surface of the urinary passages in the phthisis of children; and in female adults the catamenia are generally delayed, painful or suppressed in the advanced progress of the malady, which generally assumes a more severe and rapid form when this disorder supervenes. In a case of a young lady, who died about the age of twenty of phthisis, and who had never menstruated, the body was inspected in my presence, and the ovaria were found very small, and their coverings thickened and almost of a fibro-cartilaginous density. The disease had been attributed by me to masturbation, the non-appearance of the catamenia, and the alterations of the ovaria, probably having been caused by this most noxious vice.

124. III. PATHOLOGICAL ANATOMY OF PULMONARY TUBERCLES. On opening the thorax after death from phthisis, the lungs generally do not collapse, or collapse imperfectly. They are more or less increased in weight, in some cases very remarkably. DR. CLENDENNING found the average weight of the healthy lungs of an adult to be 46¼ ounces; and DR. BOYD, as stated by MR. ANCELL, ascertained that, in a considerable number of adult males, the average weight of tuberculated lungs was 72¼ ounces. The increase is due partly to the tubercular deposit, and partly, in various degrees, by an increased quantity of blood in the vessels, the secretion of tuberculous pus, serous effusion, red or grey hepatization of the lung, or extravasation of blood."

125. In the early stage of uncomplicated phthisis, when the tubercles are distinct, the pulmonary tissue is crepitant around them, and those which are most superficial somewhat raise the pleura. Distinct tubercles in the lungs, according to HASSE, are never larger than hemp-seeds; when they are described as larger, a congeries must be understood. *Grey* and *yellow* crude miliary tubercles seldom co-exist in the same lung, unless they are deposited at distinct periods. (See SCROFULA and TUBERCLES, §§ 65—90.)

126. i. *The seats of tubercles in the lungs* are somewhat different in adult and young subjects. In adults tubercular deposits are chiefly aggregated in the upper lobes. Miliary tubercles are most abundant in the posterior parts of the lungs, and through the parenchyma at some distance from the pleura, but there are many exceptions to this distribution. In children the whole lung, or large portions of both lungs, are the seats of deposits, which have appeared to have taken place about the same time. CARSWELL attributed the earlier and the more abundant formation of tubercles in the apices of the lungs, to the motion of these parts being more limited than those of the lower lobes. The former also are more exposed to the influence of cold externally, and are more accessible to the air, in its varying state of temperature and humidity. LOUIS, ANDRAL, and others consider that tubercles are more frequent in the left than in the right lung. HASSE, however, disputes this, but I believe with insufficient reasons. The question as to the tubercular deposit being *within* the air-cells, or *external* to them, or in other words in the parenchyma of the organ, is still disputed. MAJENDIE, CARSWELL, SCHRÖDER VAN DER KOLK, and RAINEY contend for the former; whilst ANDRAL, ANCELL, and others consider that tubercles may occur in either of these situations, and in any tissue where nutrition or secretion takes place. According to Mr. RAINEY, the earliest indications of tubercles in the lungs are deposits of a transparent or greyish, or yell

ish substance in the air-cells, sometimes completely filling and distending them; the minute blood-vessels of the parietes of the cells surrounding the deposits being still perceptible. The deposits sometimes occur in a few only of the cells, but more frequently they fill all the cells of one lobule; and in this case they press upon these vessels, which soon disappear, the whole lobule appearing, after a while, entirely formed of tubercular matter. Tubercles in the lungs thus, according to Carswell, originally assume the shape of the air-cells, and are somewhat acuminated in proportion to their projection into the bronchial tubes. When they have been of slow growth, or are deposited in large groups, and occupy numerous cells of a lobule, they resemble the sprout of a cauliflower, the pedicle occasionally extending far into the bronchial tube. In the lungs of ruminating animals, tubercular matter is often seen plugging up the bronchial tubes. As the tubercle increases in size, the central parts become further removed from the vessels by which this matter is deposited; and consequently these parts have the greatest tendency to lose their vital cohesion, and they consequently are softened; this process generally beginning at or near the centre of the tubercle. (See Scrofula and Tubercles, §§ 78, *et seq.*)

127. ii. *The distribution of tubercles in the lungs* varies much with the age of the patient and the form of the malady. In adults, in the usual and more chronic forms, the tubercular deposit commences, although in different amounts, generally in the apices of both lungs, and descends gradually downwards to the lower lobes; the larger and older cavities existing at the apices, smaller ones lower down; and accumulations of softened or crude tubercles, or of both, at the base. This cannot, however, be viewed as an absolute law. The tubercles also in one lung, as the left, may be generally further advanced in all their stages than those of the right. Besides one portion of a lung may be the seat of cavities or softened tubercles, all the rest, or the greater portion, of the lung being quite sound. Tubercles which are formed rapidly, are generally miliary and nearly equally dispersed through the lungs. In the more acute states of phthisis they are thus deposited, or are infiltrated more or less extensively or densely.

128. iii. *Lesions of the lungs associated with tubercles.—A. Pneumonia*, or inflammation of portions of the lungs, and its usual consecutive changes, are often found associated with the several stages of tubercles. The inflammation may have passed on to red or grey hepatisation; and it may have preceded the tubercular deposits, or may have been consequent upon them, induced by the usual causes of pneumonia; or it may have been produced by the irritation developed and kept up by these deposits. It should not be overlooked, that the changes taking place in the lungs of scrofulous subjects during inflammatory action, may be attended by tubercular formations. Yet this may not necessarily be the case; and these formations may exist in the lungs even of scrofulous and sanguineous temperaments without inflammatory action in the lungs being produced by them; this action being chiefly a contingent or intercurrent result of causes unconnected with the tubercular disease.

129. *a.* According to Louis, Grisolle, Hasse, Ancell, and others, *inflammation primarily attacking* the scrofulous subject, may produce an exudation of lymph differing from the exudation occurring in pneumonia affecting the healthy person, chiefly in its tuberculous characters, and the disease may run its course, and the exudation may be absorbed: but as frequently, perhaps, the pneumonia of scrofulous subjects is followed by tubercular deposits and their usual consequences. Rokitanski calls this latter change hepatisation with tuberculous deposit, which, not being absorbed or becoming purulent, ultimately passes into yellow tubercle. According to Hasse this alteration is found more frequently in males, than in females, and in persons from 18 to 25 years of age, than earlier or later in life.

130. The alterations producedby *consecutive* or *incurrent inflammation* of portions of the lungs during the progress of phthisis is manifestly much more frequent than the primary form. Louis states that he observed the results of the first stage of inflammation, commonly occupying a limited space of the lungs in 23 out of 123 cases, and the stage of red hepatisation, generally in the lower lobe in 18 cases. He regards the invasion of pneumonia in these cases as preceding death only a few days, and not peculiar to phthisis, as he observed it as frequently in deaths from other chronic maladies. Although the patient may die of pulmonary tubercles without any inflammatory appearances, yet the tubercles are very liable to irritate and inflame the surrounding tissues, and to render the patient more susceptible of the operation of the usual exciting causes of inflammation.

131. *b.* This secondary pneumonia generally assumes the *lobular* or *vesicular form*, and seldom appears until the tubercles have been developed, or have formed aggregated masses, and occasioned irritation in the surrounding structure. The matter exuded by this state of inflammatory action around the individual tubercles or masses, is generally peculiar, scrofulous and gelatinous; the spaces between being healthy. Sometimes, however, the inflammatory changes are not limited to the patches around tubercles, but extend to the vesicular structure of an entire lobule, and pass on to red or grey hepatisation, or even assume in parts a yellowish colour; the pulmonary structure being quite impermeable to air, firm and friable, the tubercles contained in it being more or less softened. In this state of the disease, the associated or intercurrent inflammation presents the usual scrofulous characters, modified by the peculiar structure and antecedent tubercular deposit.

132. *c.* The alterations found after death from the *acute form of phthisis* (§ 84.) present many of the appearances consequent upon inflammation of an acute form, in the scrofulous diathesis, associated with tubercular deposits, either antecedent to, or coeval with, the inflammatory action. As in other cases of inflammation in cachectic or unhealthy constitutions, the changes produced by it are peculiar, being diffused, œdematous, and marked by loss of the usual vital cohesion of the tissues. Hasse has well described the appearances in these acute cases. He states that one or both lungs are diseased. I have always found both lungs remarkably affected, although not to an equal amount or extent. In very marked cases the lungs from their apices to their bases are

loaded with isolated miliary tubercles, mostly yellowish and soft, but sometimes greyish and more solid. The yellow and soft tubercles are in the centres of red or grey hepatised structures; while the grey are imbedded in a texture loaded with a bloody serum. The lungs are tumefied, do not collapse when the chest is opened, are very dark coloured throughout, preternaturally soft, and gorged by dark fluid blood and serum. The tubercles have everywhere the same appearance; the pulmonary structure around them, for about a line, is more or less altered, the intervening structure being still permeable. The bronchial mucous surface is either dark-red or violet. Recent adhesions between the surfaces of the pleura are not seen. If adhesions exist, they have been formed previously to this disease. When the malady has been slower in its progress, the tubercles are more united into groups, or are more densely crowded at the apices and superior lobes, than in the lower lobes.

133. *d.* In the more *chronic and usual forms* of phthisis, the alterations often associated with the tubercular deposits are those which are clearly attributable to chronic inflammatory action, and consist of hepatisation of a red or grey colour, or of varieties of hue of which these are original types. The parts thus altered are dense, impermeable to air; the bronchi are filled with a dense whitish matter, and the natural structure cannot be traced, the part being firm, but friable, or readily torn. The cut surface is speckled with grey inclining to yellow, is diversified with white stripes and arborescent black patches, and is devoid of the granulations of acute pneumonia. The incision is not followed by any exudation, and pressure yields only a little turbid greyish fluid. The inferior lobe of one or both lungs is thus chiefly affected; the alteration proceeding upwards, and meeting the tubercular deposits as they advance downwards. According to Hasse, this associated inflammatory alteration, which differs from the effect of common pneumonia in the induration of the lung, invades only the lower portion of one lung only, whilst the tubercular deposits exist in both.

134. *B. Extravasation of blood* in tubercular lungs is met with in either a fluid or clotted state: —1st. It may occur as a simple exudation from the bronchial mucous surface; —2nd. It may proceed from ulceration of the bronchi; —3rd. Blood may be infiltrated into the parenchyma of the lungs in connection with congestive pneumonia complicating tubercles; — 4th. It may be infiltrated not only into the parenchyma, but also into the air-cells; —5th. It may be effused from a laceration of the structure of the lung; — 6th. It may be effused from the ulceration of a number of capillaries in the parietes of a cavity, or of one large vessel; —and 7th., It may proceed from the rupture of a cavernous band, or of a vessel or vessels in such band. In most of these the blood is found either in a frothy or fluid state in the trachea and bronchi, or partially coagulated; and coagula are contained in cavities, and sometimes in the bronchial tubes. In these several forms, excepting the two last, the effused blood may become the seats of tubercles. Extravasation of blood is met with in all stages of tubercular phthisis. According to Hasse, it is found chiefly where tubercles have been rapidly formed in connection with inflammatory action, or when the lungs are replete with densely clustered tubercles. Carswell considers, that the sanguineous effusion is in many cases owing to the compression of the pulmonary veins by the tubercular masses, and to the consequent prevention of the return of the whole of the blood sent to the organ. Both of these explanations may be correct as respects different cases.

135. *C. Œdematous infiltration* of the lung is sometimes seen, but generally only to a small extent; and chiefly in the acute form of the disease, in the more cachectic and phlegmatic habits; or when phthisis is complicated with disease of the bronchial glands, or of the kidneys. Rilliet and Barthez consider that serous congestion or œdema of the lungs is sometimes connected with the deposit of tubercles in children; that it may be produced by this deposit; but that it most frequently depends upon compression of the vessels by enlargement of the bronchial glands.

136. *D. Emphysema.*—Vesicular emphysema is frequently found in tubercular lungs, in chronic cases, in connection with various other lesions, chiefly in the superior and anterior parts. It occurs at an early stage, generally in a diffused form, and is produced by the pressure of disseminated tubercles upon the minute bronchi; the more powerful act of inspiration filling the cells, whilst the less powerful expiration fails in emptying them. Emphysematous portions of the lungs rarely contain tubercles. But this alteration is seldom found to a great extent, and generally in cases where it had not been detected by the physical signs: "it is usually seen in the upper parts of the lungs, and often in conjunction with cicatrized and collapsed portions. The healing process, by absorption of the more liquid parts of tubercles and of tubercular vomicæ, by shrivelling the remainder, by cicatrization of the ulcers, and obliteration of blood-vessels and bronchial tubes," produces a vacancy in the space within the thorax, and this space is gradually, or more or less, filled up by the sinking inwards of the walls of the chest, and by the dilatation of the air-cells in the adjoining still permeable portions of the lung; this latter result sometimes preventing the occurrence of the falling inwards of the parietes of the thorax.

137. iv. *Softened or liquified tubercles.*— I have stated above (§ 126.) the views of Mr. Rainey as to the softening of tubercles; and those of Laennec, Louis, Schröder Van Der Kolk, Hasse, and others have been stated in the article Scrofula and Tubercles (§§ 78, *et seq.*). It is not improbable that the process of softening may not be limited to one only of the modes contended for by these pathologists, but that when it commences or proceeds in the centres of the tubercles, it may also be advancing in their circumferences, owing to the irritation produced by them, and to the fluid effused from the irritated tissues surrounding them; the softening thus advancing from the centre to the periphery, and from the latter to the former of the tubercle. Generally it is found, that softening of tubercular deposits first takes place, conformably with the progress of the deposits, in those nearest the summits of the lungs, and proceeds downwards. With the process of softening, the pulmonary tissues surrounding the tubercles become more vascular, and inflammatory or congestive changes take place, extending

more or less in the parenchyma, and ultimately to the pleura, as already shown (§§ 111, 112, *et seq.*). The results of the softening are, discharge of the liquified matter into the bronchi communicating with these tubercles, and the formation of a cavity, which enlarges by successive tuberculation and softening, by continued discharge, and by the coalition of two or more softened tubercles and small cavities.

138. v. *Tubercular Cavities and Vomicæ.* — *A.* Tubercular vomicæ, as Mr. Ancell justly states, are either,—1st, pulmonary,—2nd, pleuro-pulmonary,—3rd, broncho-pulmonary, or—4th, broncho-pleuro-pulmonary, according to their connections with the principal structures of the lungs. The most frequent *seat* of vomicæ and cavities is the summit of the superior lobes of the lungs. They are sometimes seen only on one side, tubercles on the other side being still crude or softening; but when the disease is of long duration they have formed on both sides. When they are found in the lower lobes, or at the base of the lung, they are generally more numerous, larger and older in the summit. Proceeding from above downwards, the following grades or succession of tubercular alterations are observed:— 1st, old cavities, with firm or almost smooth parietes, generally empty: —2nd, more recent cavities with tuberculous deposits in their walls, or softened irregular parietes, containing matters about to be noticed: —3rd, softened tubercles, either isolated or aggregated:— 4th, crude tubercles:—5th, semi-transparent grey granulations; and,—6th, healthy crepitant lung. This succession arises from the progressive development of the tubercular deposit from the summit to the base. The cavities are generally seated deep in the lung, but in some cases they are superficial or near to the pleura. In the former case they commonly open into the bronchi; in the latter, they are disposed to perforate the pleura, but are prevented by the adhesions formed by this membrane (§ 112.). Large excavations are usually seated nearer to the posterior than to the anterior surface of the lungs, where they extend to the interlobular fissure, and even sometimes communicate with other cavities in the lobe below.

139. *B. The dimensions and form* of the cavities vary much. Their size varies from that of a pea to that of a large orange; small cavities are generally spherical or oval; but as they enlarge, their form is more irregular, owing to the softening and disorganisation of the parietes having proceeded more rapidly in one direction than in another. Where several large cavities communicate, one unequal and sinuous excavation is formed, sometimes with fistulous tracts, and is very irregular in shape, direction, and size, but terminating in one or more ulcerated bronchi. The *number* of cavities is often considerable, the largest frequently arising from the union of several small ones. A single excavation is comparatively seldom met with. A cavity is surrounded by crude miliary tubercles, with very rare exceptions.

140. *C. The contents* of excavations may be air; or viscid, purulent, or sanious fluids, containing whitish, curdy, tubercular matter, more or less softened; or purulent secretions of a dirty greyish, or yellowish, or yellowish-green colour, sometimes streaked, tinged or mixed with blood; or blood more or less pure, fluid or coagulated. The fluid puriform contents are sometimes fœtid, owing to their long retention, a communication with a bronchus not having been formed. Old cavities are often empty; recent ones frequently contain purulent or sanious matters, and the softened remains of tubercles. These matters are thus the secretion from the parietes of the cavity, and the debris of tubercles and of the surrounding tissues, altered more or less by retention in the cavities or by the action of the air. Fragments of the pulmonary structure are seldom found in the excavation, but when seen they are more frequently attached to, than detached from, the parietes. Bridles or chords are occasionally found stretching across a large cavity: these consist of *blood-vessels*, whose coats had become inflamed and thickened, their contents coagulated, and, having resisted the disorganising process of the adjoining tissues, had been reduced to chords.

141. Hasse describes the blood-vessels forming bands across cavities as often having their coats reduced to a single, uniform, lardaceous substance; and their canals, which still continue although narrowed, become eventually filled with a thin, reddish, fibrinous plug. The bands, or cords, thus formed by the blood-vessels are, in rare cases, either partially destroyed or torn asunder, before their canals are completely closed: and thus the more violent attacks of hæmorrhage ensue, and often prove fatal, the cavity and bronchi corresponding being found full of coagulated blood, and which also often fills, in a frothy state, the trachea. The *bronchi* are early destroyed; but, even when completely ulcerated, they often do not admit air into the cavity, nor the exit of the matters contained in a cavity; for they are plugged by lymph formed within the parts nearest the cavity, or by tubercular matter or deposits formed within them. The bronchi are not found in these bridles, which are thinner in their middles than at their extremities, the former having been longer exposed to the morbid processes.

142. *D.* The *Parietes of Cavities*, when recent, are merely the pulmonary tissues somewhat condensed by exuded lymph, or infiltrated with a greyish matter, or with grey granulations and crude tubercles. They are very rarely smooth, and formed only of the condensed pulmonary texture. In rare cases they are coloured by a brownish or blackish melanotic deposit. External to these parietes, which may not extend above a line or two into the pulmonary structure, the parts immediately surrounding them are healthy and crepitant. Somewhat older cavities are lined with a slightly adherent and soft false membrane. This lining is friable, white or yellowish, resembles concrete pus, and has no vascular connection with the surrounding tissues. It seems as a deposit on the surface of the cavity from the matters therein contained. In still older cavities, external to this deposit, a membranous, organised layer, of a greyish fibro-cellular substance is formed, and is closely adherent to the pulmonary structure. This constitutes the true cyst or parietes of the cavity. This capsule becomes after a time more organised, and, from fibro-cellular, it is fibro-serous, semi-transparent, and in patches, or more extensively fibro-cartilaginous, unless where bronchi pass into the cavity. These latter changes are observed only in very old cavities; and vary in colour, vascularity, density, and appearance, with their duration. The internal surface of these parietes or

capsules no longer presents the concrete matter first deposited, and forming the early false membrane, but appears, at a much later period, smooth or velvety, and of a pearl-grey, pinkish, or reddish hue.

143. *E. The discharge or the absorption of the contents of vomicæ* are matters of interest. The *discharge* takes place by means of the bronchi, which are destroyed in the seats of vomicæ, and which become irritated, inflamed, and ulcerated by the matters formed and passed along them; the discharge from the bronchi, communicating with cavities, being often greater than that proceeding from the latter. When the matters contained in vomicæ are long retained without having communicated with bronchi, they often become very offensive and irritating to the bronchi and trachea during their discharge, and occasion the inflammatory appearances observed in these parts.

144. *F.* The *absorption* of the contents of cavities may be inferred when they are found empty, without any manifest communication with bronchi, — when this cannot be detected upon dissection, and when the history of the case furnishes no proof of the discharge of these contents during life. I have already alluded to instances of acute phthisis which terminated fatally without expectoration and cough, but preceded by the typhoid symptoms characterising contamination of the blood by the absorption of morbid matters; and in those the cavities, generally small, were empty, their parietes being soft, or covered by a semi-concrete puriform substance.

145. *G. The healing processes presented by tubercles of the lungs* have been described by ROGET, BOUDET, LAURENCE, BAYLE, BENNETT, ANCELL, and others. HASSE conceives that the cicatrisation of tubercles cannot take place if the amount of tubercular deposit be considerable or great; and if the softening be, as it usually is, attended by the continued formation of tubercles. The degree, or the procession, of morbid change in the lungs admitting of remedy cannot be defined, even if both were objects of precise observation. The states of organic nervous power and of the circulating fluids should be viewed as the chief sources, from which the local lesions are to derive reparation. And this end can be attained only by supporting this power, by enabling it to improve the digestive and assimilating processes, and thereby rendering the circulating fluid more vitalised, and less capable of forming or perpetuating the tubercular deposits. Under the influence of this system, and of the improved condition of the blood, morbid products are more sparingly formed; those which are formed have their more fluid parts absorbed; they are consequently atrophied, and their more solid, earthy, or saline parts, as respects tubercles especially, alone remain, either in a passive or inert state, and are increased by subsequent depositions, or exist in such condition as gradually advances their discharge. This is the course usually pursued in the removal of tubercular deposits before cavities are formed, and has thus been termed the process of *cretification*. (§§ 146, 147.)

146. *a.* As regards *the formation of these concretions* it may be inferred that the organic elements of tubercle are absorbed, and carbonate and phosphate of lime deposited in their place; so that the concretions cannot be viewed as the mere solid remains of the pre-existing tubercles. HASSE remarks that the calcareous deposit, in some cases, especially in young subjects, takes place somewhat rapidly, the outside of the tubercle being then changed into a hard crust, while the central part retains its softness. Occasionally the calcareous matter appears to have been deposited at intervals, producing a series of hard, distinct superimposed strata. Most frequently when the process advances slowly, the tubercles appear like to moist chalk. Thus the volume of the entire mass continues to diminish, so much so that a considerable portion of lung, as may be inferred from the size of the bronchi leading to it, becomes reduced by obliteration and shrivelling, to a hard shell, holding in its centre a chalky tubercle no bigger than a pea. This healing process is by no means rare, its traces being often found in the lungs of very aged persons who have died of different maladies, and not unfrequently also in much younger subjects.

147. *b. Tubercular cavities heal* in the same manner whether they are connected with several bronchi, or shut out from the air-passages. In the latter case exactly the same capsule, resulting from inflammatory induration of the surrounding structure, is found, wherein the enclosed tubercular mass is converted first into a chalky pulp, and ultimately into a *hard calcareous concretion*. The majority of these concretions originate in the small and still closed cavities. They are irregularly shaped, with a granular rough surface, are hard or friable, and often contain mealy or soft nuclei. They are found most frequently at the summits of the upper and of the lower lobes, firmly impacted within a shrivelled and condensed structure. "In rare instances the residue of tubercular matter, left within the larger cicatrised cavities, is by degrees converted into earthy granules. These are loosely held within the scar-contracted cavity, where they mingle with tubercular and muco-purulent fluids, and may become ejected during a violent fit of cough, provided the implicated bronchial tubes still remain open." — (HASSE, &c., p. 340.)

148. *c. Cavities cicatrise* in different ways. They may disappear altogether, or contract only to a limited extent. In the former case they are united and filled by a cellulo-fibrous substance. In this case the membranous lining or paries of the cavity becomes thickened by a deposition of plastic exudation or lymph, either upon its external or internal surface, most probably upon the former. The membrane thus grows and contracts towards the centre, until the cavity is filled with a fibro-cellular substance. The gradual obliteration of the cavity is further effected by the condition of the adjoining parts. If the vomica be near the surface of the lung, the pleura becomes much thickened, and the walls of the thorax sink inwards, so as to favour the shrivelling process. The corresponding bronchi are closed, and the healing of the cavity is effected, the remaining scar being either thick, or roundish, or elongated.

149. When the cavities contract only to a limited extent, and simply lose their original characters, their walls are moulded out of the aforesaid layer of shrivelled parenchyma, which now neither contains nor secretes tubercular matter. "These extinct vomicæ are frequently seen at the apex of the lungs, and might readily be taken for mere

bronchial dilatations, were their real nature not disclosed by the relations of the surrounding pulmonary texture, by the co-existence of cretaceous masses, and above all, by the character of the membranous lining, which essentially differs from, and does not immediately unite with, the mucous coat of the bronchial tubes." This internal lining usually adheres firmly to the indurated walls of the cavity, and is either thick, reddened, and velvety, or pale, smooth, and thin.

150. The state of the pulmonary structure, both adjacent and more remote, is influenced by the above healing process; and the consequent changes are well described by **Hasse**. The inflammatory exudation upon which the above alterations depend, often involves the whole of the apex, if not the entire upper lobe of the lung, while the collective bronchial tubes degenerate into white, thread-like ramifications. The involved parenchyma of the lung is now converted into an almost cartilaginous mass, impervious to the air, very scantily supplied with blood-vessels, and presenting, when cut, a smooth glistening surface. Obliterated pulmonary vessels, closed bronchi, cicatrices, and parenchyma infiltrated with plastic materials, are hardly to be distinguished from each other; and the whole adheres firmly, by means of the thickened semi-cartilaginous pleura, to the sunken walls of the chest. A few cretaceous tubercles are still found scattered throughout the hard, nearly homogeneous mass, which, below, merges sometimes gradually, but more often suddenly, into the healthy texture.

151. *d*. The deposition of *black pigment* into the lungs during the healing process is a very remarkable fact. It is found wanting only, or almost wanting, in the rare instances of the repair of tubercular disease by means of calcareous deposits in youthful subjects. In older persons the black pigment is so constant, and so considerable that it might be doubtful whether it be the cause, or the sequel, of the cure of phthisis. "Not alone the parts closely adjoining calcareous tubercles and cicatrised cavities, but, in like manner, the entire mass of those extensive indurations of the upper lobe, just described, are found densely loaded with this pigment. Even the moist chalk-like residue of tubercular masses is often so imbued, as to exhibit a slate-grey or a bluish black tinge." In other cases, where tubercles are more limited, and in young persons, the pulmonary structure is puckered, without induration or extensive obliteration; the cicatrices appearing elongated, the cretaceous residue as isolated granules, and the black pigment uniformly but less densely disseminated in the interstices of the air cells. The cicatrices are surrounded by emphysema and dilated bronchi, and the thorax is seldom found depressed.

152. *H. In children* the lungs are less the predominant seat of tubercles than other parts, especially the mesenteric and lymphatic glands and the bones. When deposited in the former in excess the tubercles pass through their stages rapidly. In very young children the pulmonary deposits are often latent, death ensuing from the co-existence or supervention of disease of other parts. In those subjects who have died of other maladies, the lungs contain greyish, transparent semi-fluid granules or tubercles, not confined to the apex, but existing equally in the lower lobes. The bronchial glands are at the same time very tuberculous. **Billard** met with five instances of tubercles of the lungs in new-born children; **Husson** and **Kennedy** in the fœtus. I have seen the disease in the lungs of several infants of the age of a few months only. The disease in young children is generally acute, and it usually is of this form up to the age of seven or eight years. In young children the tubercular deposits may be as great or even greater in the bronchial, mesenteric, and cervical glands; in the liver, spleen, brain and its membranes, and kidneys, as in the lungs.

153. *I*. The tubercular and other lesions, found in the several organs of *adults* dead of phthisis, are often very numerous. Many of them have been already described when noticing the *complications* and intercurrent affections of the disease. In the advanced stages, pleural inflammations occur, productive of every variety of false membrane, of adhesions, of miliary tubercles upon the pleura and within the exudations on its surface, and of turbid, reddish, serous or purulent effusion. When the trachea and larynx are affected, as described above (§ 109.), as well in many other cases, the bronchial glands of the neck and those seated along the trachea are similarly affected, and exhibit all the phases of tubercular disease. The heart is quite devoid of fat in most cases. **Gluge** states that he always found the blood within the larger veins and the heart in phthisis to contain pus-globules, to which circumstance, much of the constitutional symptoms may be referred. **Louis** and **Bizot** have remarked that the aorta is always more or less contracted. The alterations of the liver and alimentary canal are always remarkable, and described above (§§ 114—118.). From the searches of **Louis**, **Mohr**, and **Hasse**, it would appear that tubercles exist in other organs besides the lungs in the pulmonary phthisis of adults in the following ratio. The bronchial glands were tuberculous in about one-fourth the cases; the mucous membrane of the trachea and larynx in one-twentieth only; the cervical glands in the same proportion; the intestinal canal in one-half the cases; the mesenteric glands in more than one third; the mucous membrane of the stomach very rarely; the serous membranes very often, and in the following order of frequency: — pleura, peritoneum, arachnoid, pericardium. The liver, spleen, urinary organs, brain, spinal chord, are occasionally implicated. The testicles, and the mucous surface of the Fallopian tubes are also sometimes affected. With the exception of the brain and the heart, the absolute density and weight of most organs, more particularly of the lungs, liver and spleen, are augmented in tubercular phthisis. It therefore follows, that the enormous loss in weight sustained by the body, amounting, on an average, to about 50 lbs., is due to the loss of adipose substance.

154. IV. **Tuberculosis of the Bronchial Glands.** — *Bronchial Glandular Phthisis.* — The bronchial glands may become tuberculated, either *primarily* or *consecutively*, of similar deposits in the lungs. It is chiefly to the *primary form* of tuberculated bronchial glands that attention is now to be offered. This is almost exclusively *a disease of childhood*. In this primary form, originating in adult or advanced age, bronchial glandular phthisis is comparatively rare; and in the aged it is almost always the mere attendant of

lingering pulmonary phthisis. Primary tuberculosis of the bronchial glands generally commences between the first and second dentition, and finishes its course with the appearance of puberty; although its consequences are sometimes manifest beyond this period. It is obvious that this form of the disease may be associated with tuberculosis of the lungs and of other organs. It may, however, and often does, run its course without any tubercles being deposited in the lungs; or the lungs may become implicated at any period of the glandular malady, and be disorganised with the glands; or, lastly, bronchial glandular phthisis may subside.

155. The course of bronchial glandular phthisis is generally chronic; and the destruction and shrivelling of the affected glands proceed so gradually as to allow the organism time to compensate for the loss. "Hence it readily admits of reparation; nor is it in itself perilous, although accidental circumstances may render it fatal." (Hasse, p. 349.) The glands at the bifurcation of the bronchi are earliest attacked, and first pass through the several morbid stages. Thence the morbid process generally diverges into three distinct directions: — first, to the symphatic glands following the ramifications of the bronchi into the pulmonary structure; secondly, to those placed between the pericardium and the lungs, and along the œsophagus in the posterior mediastinum; and, thirdly, to those which accompany the large vessels in the anterior mediastinum, and pass from thence to the trachea and the cervical plexus. Only where tubercles are primarily seated in the mesenteric glands do they appear to advance to those glands which follow the course of the œsophagus, passing thence to the cervical plexus. In some instances they probably originate in the glands of the neck.

156. An occasion seldom offers of examining tubercles, in these situations, in their nascent states. In these states they then appear as grey or yellow granules, up to the size of millet-seeds. In a short time the glands become so infiltrated with tubercles as to form a yellowish white friable substance, in which no vestige of the former healthy texture is discernible. They thus enlarge remarkably; those at the bifurcation of the trachea often attaining the size of a pigeon's egg, those within the lung, that of a hazel nut, their size decreasing with their remoteness from the part first affected. Though but loosely attached in the midst of cellular tissue, in the healthy state, they now coalesce by its medium with the adjoining parts, especially with the bronchi, acquiring from the lardaceously condensed cellular tissue a firm isolating envelope. (Hasse.)

157. These glandular enlargements but seldom produce very marked symptoms of compression of nerves or blood-vessels, although important trunks and branches run in their vicinity; but it is not improbable that the little attention hitherto paid to the lesions of the bronchial glands in children has led to the misinterpretation of the symptoms and effects produced by them, and to the disorders actually caused by them being imputed to other sources. It is extremely probable that *spasmodic croup* (see Art. Croup, §§ 13, 14.), *Laryngismus stridulus*, and other affections of the *trachea* and *bronchi*, are either caused, or aggravated, or perpetuated, by tubercular enlargements of these glands, although nervous filaments and arteries are found, on careful dissection, traversing the localities of, and obviously pressed by, these glands. The veins, however, are more susceptible of pressure by them; but the bronchial canals are seldom much affected by them, owing to the resistance furnished by their cartilaginous rings, and to the more yielding structures adjoining. In some cases, notwithstanding, as shown by Andral, the pressure has acted injuriously on the bronchi; and it may, even in adults, be connected with the pathology of some cases of *asthma*.

158. The tuberculous deposit in the bronchial glands may long continue without much change; but more frequently it undergoes softening. Hasse states, that when the softening proceeds from the centre, one or more small excavations are found containing a purulent and gritty matter, and the process is tedious. When the softening commences at the circumference, the filamentous sheaths of the glands are highly vascular and puffy, constituting at last a mere cyst around the thick, yellowish, tuberculo-purulent fluid. From this period the tumour collapses, its contents either becoming gradually absorbed, or escaping through a passage made by them. Absorption proceeds very slowly, being carried on chiefly by the external vascular coat of the tumour, the inside of which coat has a red velvety appearance. Like a vomica, it generally possesses an unorganised membranous lining, formed of thickened pus and tubercle. The cavity thus produced does not, however, like the pulmonary excavation, continue to enlarge: its walls receive no additional deposition of tubercle, but rather protect from this occurrence; and in no case do two adjacent glands communicate or form one cavity. On the contrary, as the fluid contents are absorbed, the cyst contracts upon the more consistent residue, which, lessening gradually, acquires a cretaceous character, and ultimately is converted into a hard concretion. These products are often met with, even in youthful persons, in the place of one or other of the bronchial glands, especially at the bifurcation of the trachea. (Becker.)

159. "When the tuberculous mass has remained fluid until long after puberty, or the disease has arisen at a later period, black pigment becomes deposited, both in the unsoftened portion, and in the pap-like matter." It is so intimately combined with the latter, as ultimately to form an uniform, black, smeary pulp. In such cases the tumour, whilst gradually contracting in dimensions, retains the same soft condition for years. Sometimes separate calcarious nuclei are found in the midst of the blackened mass. "This deposition of pigment within glands, totally degenerate and partially destroyed, is the more remarkable, as furnishing a proof of connection with the lymphatic vessels. It can scarcely be reckoned an immediate secretion from the glandular cyst and *necessarily* concerned with tubercular cicatrisation, because this process in other organs (the lungs excepted,) and especially in lymphatic glands, is scarcely attended by any deposition of black pigment." (Hasse.)

160. Softened tubercle often escapes by perforating the bronchi, generally from without inwards, the tuberculo-purulent fluid bursting through the bronchus. Years are in such a case required for perfect recovery, which is brought

about either by the gradual healing of the aperture, whilst the subjacent gland shrivels away; or by the closing of it, ere the contents of the gland are entirely voided; the remainder afterwards passing through the several phases, until it undergoes the calcareous change. Sometimes the irritation is renewed at a subsequent period, and the concretions come away.

161. Various other consecutive lesions supervene contingently upon those now mentioned; but these are individually of so rare occurrence as hardly to deserve enumeration. The chief of these are—1st, the escape of the tuberculated contents of a bronchial gland into the parenchyma of the lung;—2dly, perforation into the pleural cavity, where the softened glandular mass is situated immediately under the pleura, at the interlobular divisions (**Berton**, **Rilliet** and **Barthez**);—3rdly, perforation of the œsophagus (**Berton** and **Lablond**);—4thly, simultaneous perforation both of the œsophagus of the trachea and of the pericardium (**Syme**);—and 5thly, perforation of the parietes of one of the large blood-vessels. Of each of these only two or three instances have been recorded.

162. In *children*, in whom alone this disease appears primarily or independently, the lymphatic glands of other parts, especially of the mesentery, often afford the sole evidence of concurrent disease. The lungs are, in particular, sometimes quite free from tubercles. **Papavoine** states that of forty-nine children affected with tubercles of the bronchial glands, but thirty-eight had tubercles in the lungs. **Rilliet** and **Barthez** never found other organs in children tuberculous, without the bronchial glands being pre-eminently so. Still bronchial glandular phthisis in children often induces acute tubercular disease, the lungs, the liver, the spleen, the kidneys, the serous membranes, &c., being all found, in various degrees and frequency, to contain recent tubercles. In *adults*, on the contrary, in whom either recent, or the remains of former, bronchial glandular phthisis may be discovered, tubercular disease of the lungs always predominates, and is in itself fatal. (**Hasse.**)

163 V. **Duration of Tubercular Consumption.**—It is not improbable that tubercles may exist in the lungs of a person, hereditarily or constitutionally predisposed to phthisis, from an early age, in a quiescent state, or without advancing to the stage of softening, without shortening by many years the duration of life. This is more likely to occur when the determining causes of the disease have either been avoided, or have not acted with much intensity. Instances have come under my own observation that have been characterised by the chief symptoms of the first stage, and by occasional attacks of hæmoptysis, from an early period of life, and yet they reached to upwards of 60, and in two cases to 68 and 69 years. I have no recollection of an instance of 70 have been passed in such circumstances; but Dr. **Gregory** mentions a case of a person who was consumptive from 18, and died of the disease at 72 years of age. Phthisis, with the few exceptions arising from the occurrence of acute states of the disease, is essentially chronic or protracted. In general its duration is much shorter in hospitals, and wards containing a number of cases of the disease, and in crowded workshops and manufactories, &c. In 215 fatal cases at the Hospital for Consumption—in 193 cases observed by **Louis**, and in 200 noted by **Bayle**, the duration was as follows:—

Duration.	*Hospital.*	*Louis.*	*Bayle.*
Less than a month -	- -	1	1
In one month -	- -	3	1
From 1 to 3 months -	1	11	14
From 3 to 6 months -	22	52	44
„ 6 to 12 months -	66	62	64
„ 12 to 18 months -	34	24	30
„ 18 to 24 months -	22	17	18
„ 2 years to 3 years -	29		
„ 3 years to 4 years -	13		
„ 4 years upwards -	14		
„ 2 years to 8 years -	- -	23	18
„ 8 years to 20 years -	- -	- -	10
Doubtful - - -	14		

Although tubercles in an early stage may long remain latent or quiescent, yet when they begin to soften, there is every reason to suppose that their advancement is progressive, although at varying rates, or even so slow as to be nearly stationary. It is manifest that numerous circumstances after the commencement of phthisis must tend to accelerate its progress on the one hand, or to retard or arrest its course on the other. The continued or occasional operation of any of the causes of the malady—seasons, weather, climate, age, sex, constitution of the patient, medical treatment, diet and regimen, may operate in either way. In the Hospital for Consumption it was observed that of those who died within eighteen months 60.5 per cent. were males, but only 50 per cent. were females; whilst of those who lived beyond eighteen months, 31.9 per cent. were males, but 45.5 per cent. were females. According to the tables of **Louis** and **Bayle**, the duration of the disease was twenty-three months, which nearly agrees with M. **Andral**'s experience at La Charité. Sir J. **Clark** remarks that in the upper ranks of society, where patients have all the advantages of the best regimen, of change of air, and of medical treatment, the average duration of phthisis is probably not much short of three years.

164. VI. **The Prognosis of Phthisis.**—The result in most of the cases of consumption will become apparent from what has already been adduced. *A.* The slower the pulse, and the less acceleration remarked in it by change of posture, cough and mental excitement, the more favourable may be the opinion formed of the duration, if not of the ultimate issue, of the disease. The absence of the flocculent and puriform characters of the sputa in the advanced stages, and of the symptoms and signs of pneumonia, pulmonary congestion, pleurisy, &c.; an increase of flesh, strength, and weight, or even the arrest of progressive emaciation; the non-appearance of night or morning sweats or diarrhœa; the respiration remaining only moderately accelerated, or not being accelerated in a much greater ratio than the pulse; the absence of marked anæmia, emaciation and debility, and of the other complications besides those just mentioned; the persistence of accustomed discharges, and the continuance in females of the catamenia in the natural or accustomed state; the tolerably regular discharge of the several secreting and excreting functions, especially those of the bowels; quiet repose during night; a mild form of the hectic fever, and an improvement in one or more of the chief symptoms and signs of the malady, may severally or all be viewed as indications

of a slow or protracted, if not of a curable state of the disease.

165. *B.* Much *less favourable*, and indeed most commonly *unfavourable*, are the following:—Rapidity, softness and smallness of the pulse, or a pulse ranging about or above 110 in the adult; quickness of respiration above the ratio which the respiration bears in frequency to the pulse; the states of the sputum indicating the second or third stages of the disease; the appearance of aphthæ on the tongue or mouth, or the symptoms or signs of any of the chief complications described above (§§ 104, *et seq.*); the occurrence of profuse sweats or diarrhœa, without any obvious cause; inability to lie on either side; great emaciation or the production of bed-sores; manifest anæmia conjoined with great rapidity and smallness of pulse; great dyspnœa and oppression throughout the thorax; suppression of accustomed or natural discharges or evacuations; a clubbed and fusiform state of the fingers, and incurvation of the nails; loss of the hair, with profuse perspiration from the scalp, neck and chest; pain and constriction extending between the sternum and spine; the occurrence of a wandering delirium during the febrile exacerbation of the evening and night; and the loss of appetite for food, are the chief indications of a progressively fatal state of the disease.

166. The hæmoptysis so frequently indicating the commencement and progress of phthisis, as well as being an important complication, may, according to its character and amount, be either a favourable or unfavourable occurrence. If it be an early or incipient occurrence, the pulse being neither very frequent nor small; if the pulse fall in frequency, and if oppression in the chest, and difficulty of breathing be diminished by it; if it be of a moderate amount, or even if it be very abundant, and be followed by an amelioration of the symptoms, it may prove even beneficial, by removing pulmonary congestion and incipient inflammatory action, although the presence of a portion of the blood in some of the bronchi may excite inflammatory irritation of their mucous surface. When, however, the hæmoptysis is very scanty, or merely streaks the expectoration, or if it be brownish, rusty or black, and at the same time scanty or very moderate, it then may be viewed as an unfavourable circumstance, or as indicative of active congestion, or of congestive pneumonia of a portion of lung; if it be abundant, protracted, and the blood very dark and gelatinous, no relief of the oppression and dyspnœa following it; and if, in either case, the pulse becomes even more frequent, and the respiration more rapid, the danger is great. In a case of this last description which I saw a few years ago at Lowestoft with Mr. WORTHINGTON, an arrest of the hæmorrhage was procured by means of the oil of turpentine, and the recovery became complete under the treatment advised in the sequel. Hæmoptysis at an advanced period of the disease, more especially when cavities are formed in the lungs, and the loss of blood large, is always an alarming symptom. The same opinion should be formed if the expectoration be a sanious, ichorous, or offensive character, or if it contain shreds or small pieces or patches of disorganised substance or tissue.

167. The existence of cavities, although clearly indicated by all the usual physical signs, is not a sufficient reason for viewing the disease beyond amelioration or even cure, if the pulse and respiration be not greatly accelerated, and the other symptoms be not unfavourable, and especially if the flesh and strength of the patient be not very much reduced; for one or even more cavities may exist in the lungs, and still sufficient healthy structure may remain to perform the functions of respiration, provided that these functions be not too heavily taxed, and that the remaining lungs be not the seat of inflammatory action or congestion, or of tubercular deposit. The falling in and immobility of the parietes of the chest, with great acceleration of the respiration and pulse, difficult respiration, sweats, diarrhœa and aphthæ are in such cases the indications of a not far remote dissolution. If the patient, not having retrograded during winter or spring, experiences an aggravation of all the symptoms upon the sudden occurrence of warm or hot weather, it may be inferred that no amelioration can be expected; for I have observed, that patients thus affected by the transition to a range of temperature of about 70° or upwards, generally do not survive above a very few months; and that those who are improperly sent to a warm climate at an advanced stage, soon have their existence terminated by the injudicious change.

168. VII. THE CAUSES OF TUBERCULAR PHTHISIS may be supposed to be fully ascertained, and their influence in producing the prevalent and fatal malady duly estimated, individually and concurrently, by the numerous writers who have treated of its forms and symptoms; yet have these causes been often imperfectly ascertained, or incorrectly imputed, in respect of certain states of the disease, and their sources, nature and co-operation very insufficiently investigated. Hereditary predisposition is fully admitted, but the other remote or predisposing causes, which appertain especially to the parent or parents, and influence the organisation of the offspring, are insufficiently recognised. The predisposition, also, which is generated, and the more direct effects produced in the frame by the causes which depress the vital influence — whether mental or physical—whether morally or corporeally exhausting— in circumstances peculiar to the individual, by the removal of agents to which the frame has become habituated, or which are necessary to health, and by the action of other agencies, which are either obscure or concealed, or are merely concurrent in their operations with more prominent or commonly admitted causes, are often overlooked or not known; and thus the advantages connected with their prevention and removal are altogether lost. Hence, these *causes* being unknown or unsuspected, their *effects* cannot be prevented; and the means necessary to the removal of the former or the cure of the latter, are either altogether neglected, or employed accidentally, empirically, and often inappropriately.

169. When treating of SCROFULA AND TUBERCLES (§§ 13, *et seq.*), the *causes of these generic states of the disease* were then fully described; but the *causes*, which, whether acting singly or in combination, develope *this species of malady*, require attention, more particularly with reference to their modes of action. Certain of these causes, however, which have been fully considered in the article now referred to, will hardly be noticed, or noticed only with reference to this specific disease;

whilst others will receive that attention which their importance demands, with due regard not merely of the *causation*, but also of the prevention of this malady.[*]

170. i. The Causes appertaining to one or both Parents.—*A. The hereditary transmission of phthisis* is proved,—1st. By the frequency of the disease in the offspring of parents of a scrofulous diathesis or taint, whether quiescent or manifested by internal or external tuberculosis;—2nd. By the presence of tubercles in the fœtus, and in infants of tuberculous, phthisical or scrofulous parents; — 3rd. By the existence of tubercular consumption in the offspring of a scrofulous mother or scrofulous father; and the scrofulous parent having died, the children of a parent of a sound constitution, in cases of a second marriage, having been exempt;—4th. By the occurrence of the malady in a family, in which no other cause exists;—5th. By the hereditary transmission of the disease in the lower animals. Delafond states that a phthisical ram produced the disease in from sixteen to twenty sheep.

171. Phthisis may be transmitted to the offspring, —1st. As a predisposition, or proclivity, or diathesis, or taint—terms which are nearly synonymous;—2nd. As a latent germ, which may be quiescent for many months or years;—3rd. In a more or less developed state in the fœtus. The scrofulous taint of the parent, although quiescent, may give rise either to external scrofula, or to internal tuberculosis in the lungs, or in some other organ, or in several organs or tissues, especially in children and young subjects. External scrofula, or external glands which have fully suppurated, is less likely to be followed by phthisis than the quiescent scrofulous taint; but either condition will transmit phthisis to the offspring. The transmission may not take place in the children, and yet appear in the grandchildren. The predisposi-

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[*] CLASSIFICATION OF THE CAUSES OF TUBERCULAR CONSUMPTION.

i. The Causes appertaining to one or both Parents.
  A. *Hereditary Constitution, or Predisposition.*
    a. Transmission to the fœtus, or infant.
    b. Extent of hereditary transmission.
  B. *Diseases of the Parents productive of Tubercular Consumption.*
    a. A syphilitic cachexia.
    b. A constitution impaired by mercurial courses.
    c. Exhaustion of vital power, or debility caused by excessive sexual indulgences, or by masturbation.
    d. A gouty diathesis.
  C. *The Ages and the Social Condition of the Parents.*
    a. Premature congress in respect of either parent.
    b. Far-advanced age, especially of the male parent.
    c. Influences of circumcision or uncircumcision.
    d. Intermarriages.
    e. The occupation of the parents.
  D. *The Modes of Living of the Parents, in respect of Food and Drinks.*
    a. Insufficient or unwholesome food,—pork, bacon, &c.; blood and viscera of animals, &c.
    b. A vegetable and animal diet considered; fish, &c.
    c. Intemperance, and addiction to spirits,—in the male, in the female.
    d. Causes acting on the female during gestation and lactation.
ii. Causes acting chiefly during early Life, or previously to Puberty.
  A. *Inappropriate Food, Drink, and Regimen of Infants and Children.*
    a. During infancy. The milk of strumous or phthisical nurses.
    b. Insufficient or unwholesome food in childhood.
    c. Sleeping with the aged. debilitated, or phthisical.
  B. *Contaminated, cold, and Humid States of the Air.*
    a. Overcrowding, congregating, or sleeping in great numbers, in a close apartment, &c.
    b. Exhalations from privies, cesspools, drains, or from swamps, &c.
    c. Emanations from the lungs and skin of the phthisical.
  C. *Employments, Exercises, Amusements, and Regimen, previously to Puberty.*
    a. Sedentary employments, irksome occupations, &c.
    b. Deprivation of out-door exercises and amusements.
    c. The congregation of numbers in factories, rooms, houses, and sleeping apartments.
    d. Dress, day and night clothing.
    e. The influence of light, sunshine, and temperature, especially the deprivation of these.
    f. The influence of low temperature, humidity, and exhalations, &c., during sleep; sleeping apartments, &c.
iii. Causes most frequently acting during and subsequently to Puberty.
  A. *Amusements, Exercises, Occupations, Clothing.*
    a. Studies, amusements, and exercises, in both sexes.
    b. Positions of the trunk of the body, supports, stays.
    c. Clothing in respect of the several regions of the body.
  B. *Trades, Employments, and Conditions of Life.*
    a. Trades which are injurious by preventing exercise in the open air.
    b. Occupations in which dust, or other irritating matters are inhaled,—grinders, sculptors, &c.
    c. Occupations which are exposed to great vicissitudes of temperature and weather.
  C. *The instinctive Desires and Emotions.*
    a. Premature or excessive sexual indulgence.
    b. The vice of masturbation.
    c. Celibacy.
  D. *Mental Exertions and Affections.*
    a. Intense or prolonged mental exertion,
    b. The depressing mental emotions and affections.
    c. Nostalgia.
    d. Prolonged anxiety. Disappointed hopes and affections.
iv. Causes consisting of contingent or associated Influences or Circumstances.
  A. *Sex, Age, Diathesis, and Temperament.*
    a. Sex, age, &c.
    b. Diathesis and temperament.
  B. *Seasons and Atmospheric Conditions.*
    a. Humidity, dryness, temperature, and other atmospheric conditions.
    b. The seasons,—winter, spring, summer, and autumn.
  C. *Climate and Locality.*
    a. Climate and locality of various countries.
    b. Climate in connection with modes of living.
    c. Climate in connection with religious and social observances.
    d. Prevalence in England, London, &c.
  D. *Influence of Confinement in Prisons, Workhouses, and of Expatriation.*
    a. Prisons, hulks, &c.
    b. Workhouses, &c.
    c. Expatriation, &c.
  E. *Vicissitudes of Fortune, &c.*
    a. Poverty and distress.
    b. Loss of reputation, of friends, &c.
v. Pathological Causes of Phthisis.
  A. *Previous Diseases of the respiratory and circulating Organs.*
    a. Catarrh, catarrhal fever, influenza.
    b. Bronchitis, pneumonia, broncho-pneumonia.
    c. Hooping cough.
    d. Vascular lesions of the heart, with or without hæmoptysis.
  B. *Exanthematous Diseases.*
    a. Vaccination, small-pox, &c.
    b. Measles, scarlet-fever, &c.
  C. *Suppressed or excessive Secretion and Excretion.*
    a. Suppression of the cutaneous excretions.
    b. Excessive secretion or excretion,—prolonged suckling.
    c. Disordered, suppressed, or excessive catamenia.
  D. *State of organic, nervous, or vital Power.*
    a. Hereditary debility.
    b. Acquired debility.
  E. *Morbid State of the Blood.*
    a. Anæmia.
    b. Chlorosis.
    c. State of the hæmato-globulin.

ation, rising either from the scrofulous taint or from declared tubercular disease of some organ or tissue, may remain dormant through life, not having been roused by the exciting and determining causes into activity, or developed in the form either of glandular enlargement, &c., or of tubercular consumption, so that it cannot be inferred, that the offspring of a scrofulous or phthisical parent or parents, who has not been affected with either scrofula or phthisis is, therefore, free from the constitutional taint, or in other words, from the hereditary predisposition. It is manifest, however, and it will appear still more manifest hereafter, that a very varying proportion of those attacked with phthisis in any community or climate shall have been thus afflicted from hereditary predisposition, numerous other predisposing and exciting causes being sufficient to develope the malady in those not hereditarily or even constitutionally liable to the malady.

172. *a.* As to the proportion of cases of phthisis that may be referred to hereditary taint, authors differ widely. Ruysch says that four-fifths are hereditary; M. Portal, two-thirds; Mr. Ancell, one-third; M. Piorry, one-fourth; Briquet, 36 out of 90; Rufz, 24 out of 35. Mr. Ancell states, that in the Consumptive Hospital 24½ per cent. of consumptive patients were born of phthisical parents. M. Roche considers that the children of phthisical parents are doomed to the disease, and such may be the case if they be subjected to one or more of the causes which occur previously to, or during puberty and early manhood. M. Lugol states, that more than half the subjects of tuberculosis have consumptive progenitors. Of 141 persons affected with scrofulous glands, whose family history was investigated by Dr. Balman, the following accounts were furnished:—

The *Fathers* died of phthisis in	9
One or more deaths occurred from phthisis in the families of uncles and aunts on the father's side of	61
Grandfathers on the father's side died of phthisis	11
Grandmothers on this side	17
	98

The *Mothers* died of phthisis of	11
One or more deaths from phthisis in the families of uncles and aunts on the mother's side of	38
Grandfathers on this side died of phthisis	9
Grandmothers	20
	78

173. In 30 of the 141 scrofulous persons, no death from phthisis in either parents or collateral relations were ascertained; but whether the latter exhibited signs of tuberculous taint or disease does not appear. In the Hospital for Consumption, of 669 *males*, 122, or 18.2 per cent.; and of 341 *females*, 124, or 36.3 per cent. were predisposed by the disease having existed in a parent or parents.

174. *b. As to the relative frequency of the transmission of phthisis in the two sexes* opinions are opposite, and statistical information is very imperfect. J. P. Frank, J. Frank, M. Briquet, Richard, and Phillips, favour the more frequent transmission by the father, whilst Nasse and others entertain an opposite opinion. From the Report of the Hospital for Consumption it would appear that, omitting those cases in which both parents were consumptive, the father transmitted the disease to sons in 59.4 per cent., and to daughters in 43.5 per cent.; and that the mother transmitted the malady to daughters in 56.5 per cent., and to sons in 40.6 per cent. The numbers from which the above results are calculated are, however, insufficient to be relied upon; nor can the facts be determined with precision, especially as respects the absence of any taint in either parent. In a few cases in which I observed with care the constitution of both parents, the taint existing only in one parent, was communicated in very nearly an equal ratio to both sexes of the offspring.

175. *c.* The question may be asked, *In what manner or way is the hereditary predisposition transmitted?* Is it by the general organisation or constitutional formation, or by the blood, or by miliary germs? But previously to the consideration of this topic, it may be asked, Is the tubercular taint, either quiescent or manifested by internal or external tuberculosis, necessarily transmitted from parent to offspring? That it is thus transmitted, when both parents are predisposed or tainted, cannot be doubted. The taint may be latent, not having been developed into active disease owing to the inefficiency of the exciting causes. When, however, one parent only is thus tainted, all, or only some, or even none, of the offspring may be predisposed, the taint being limited to one or more, or extended, in various grades to several or to all. That the constitutional taint may exist in the offspring in the form of *miliary germs* is possible, inasmuch as several observers as well as myself have detected these germs in the fœtus where the taint has been manifested in either or in both parents; but this cannot therefore be considered as the usual manner in which the evil is transmitted. It has been supposed to be always conveyed in the blood—the taint existing in the blood of the fœtus and of the individual into which the fœtus is developed in all the stages of growth and existence. This supposition may be correct, but various considerations militate against it.—1st. There is no proof, either chemical or microscopic, of the fact.—2nd. The predisposition or taint being permanent, it cannot be inferred as always existing in the blood, which is continually undergoing changes by the functions of secretion, nutrition, and excretion—by the processes of assimilation and of waste—by the metamorphosis of the globules from the states of those existing in the chyle, through those forming the red blood, to their final extinction by the secreting and excreting organs.—3rd. If it exist in the blood, it must necessarily vary with the changes and constitution of the blood, or even be eliminated from the blood, during the processes just referred to, or by the agents often passing into and affecting the circulation, or in the course of diseases which sensibly alter the states of the blood; but no diminution or alteration of this taint has ever been produced in consequence of any or of all these agencies. That this predisposition or taint is one not existing primarily in the fluids, although more or less manifestly affecting these fluids, both the circulating and the secreted, may therefore be inferred; and that it is

present in those parts of the solids upon which digestion, assimilation, and nutrition mainly depend, must necessarily appear as a rational conclusion — that it is as much a part of the constitutional conformation—of the intimate organisation of the tissues and organs, as of the conditions and contour of the several parts and features of the individual, and of the states of intellectual and moral development and power.

176. *B. The Disorders of the Parents predisposing to Tubercular Consumption in the Offspring* are chiefly the scrofulous taint; the syphilitic cachexia; a constitution impaired by mercurial courses, or by excessive doses of mercury; exhaustion of vital power, or the debility caused by age, sickness, excessive sexual indulgences, or by masturbation; and a gouty diathesis. Certain of these have been fully discussed when treating of Scrofula and Tubercles (§§ 23, *et seq.*); and the dependence of phthisis upon the scrofulous taint fully insisted upon, as regards a very large proportion of the cases, both under that head, and above (§§ 170—175). Others of these sources of predisposition require merely a few remarks at this place. Excessive sexual indulgences, and more especially masturbation, particularly as regards the male parent, have a very marked influence upon the constitution of the offspring, if indeed any offspring be produced by persons thus exhausted. In most instances, the children of these parents are puny, very generally tuberculosed, the membranes of the brain, the substance of the lungs and other organs being often the seats of the tubercular deposits to an extent incompatible with the duration of life for any number of years or even of months; or if the effects are not so severely and early manifested, a predisposition is at least communicated to the offspring to external scrofula, in childhood or about the period of puberty, or to pulmonary tubercles about the same epochs or at later ages.

177. *a. The Ages and Social Conditions of the Parents* are not without influence in favouring a predisposition to phthisis in the offspring. Amongst the most important of these, are premature sexual congress, in respect of either or both parents, and far advanced age, especially of the male parent. The effects upon the offspring are, in all respects, the same as those just enumerated; namely, a very early mortality from internal and external tuberculosis, and a predisposition to tubercular phthisis at early or advanced epochs of existence.

178. *b.* The influences of *circumcision* and of *uncircumsion*, the former as tending to prevent, the latter as favouring, a predisposition to the scrofulous taint, have hitherto been entirely overlooked; or if any attention, even the least, have ever been directed to the matter, it has certainly been by no means adequate to its importance, as respects the constitutional and mental powers of the offspring. The subject has hitherto been viewed entirely as a religious rite, altogether superseded by the doctrines of Christianity; but unjustly superseded by the earliest schismatics in the Christian church —by some of the apostles themselves. Circumcision, however, as practised by the followers of Mahommed is very different from that inculcated by Abraham. By the latter, the whole of the prepuce was directed to be extirpated at a period of life most proper for the operation; whilst the former resorted merely to an incision. The advantages of the Jewish rite are not merely those which have usually been imputed to it; namely, the prevention of the usual effects of the retention of the follicular secretion under the prepuce; but chiefly the prevention of that excitement to masturbation about the period of puberty, experienced by, and so frequent among, the uncircumcised, especially in warm countries; and the more prolonged act of sexual congress, and the more complete as respects the female, than in persons otherwise circumstanced. The general results in connection with other predisposing causes influencing the constitution of both parent and offspring, notwithstanding several powerful counteracting circumstances, are more prolific marriages, and the less frequent occurrence of the scrofulous, phthisical, and gouty constitutions, in the Jewish than in other races.

179. *c. On Intermarriages, or marrying in and in*, amongst particular races, families, and religious sects, &c. I have already offered some remarks, when treating of Scrofula and Tubercles (§ 27.), showing the unfavourable influence this cause exerts on the offspring. As to *the influence which the several professions and occupations of life followed by the parents* may exert on the health of the offspring, it is most difficult to arrive at a conclusion, as statistics can furnish no precise data. Whatever injurious effect may be produced, is certainly manifested in the guise of tuberculosis, in one or other of its forms and seats. The only inference which can be drawn with justice from the professions and employments of the parents is, that such as are most conducive to the promotion of health and strength, will be most likely to favour corresponding effects in their children.

180. *C. The Modes of Living of the Parents as to Food, Drink, &c.*, have been too generally disregarded in our speculations on the causes of the disorders and diseases of childhood, and of the constitutional powers and predispositions of the offspring.—*a.* The injurious effects of insufficient and unwholesome food, and of the frequent use of pork and pork meats, and of the blood and viscera of animals—not only on the parent, but also on the offspring; and the respective influences of a vegetable and an animal diet, were considered when treating of Scrofula and Tubercles (§§ 31, *et seq.*). To these topics I need not revert; but the use of fish, or a purely fish diet, including shell-fish, has not been satisfactorily investigated. In the Shetland Isles, where I resided up to the age of sixteen, and visited for short periods for several years afterwards, the labouring classes live chiefly, or rather entirely, on fish, potatoes, meal, and cabbages, — the kinds of fish being the most wholesome and best, — the cod, ling, the torsk, hallibut, haddock, whiting, skate, coal-fish, &c.; and these are very generally taken with the oil of the recent livers as the only sauce. Those who live in this manner are healthy, enduring, and but little subject to visceral disease. Shell-fish is more productive of cutaneous affections than the fish now mentioned; and the former is more frequently followed by other injurious effects, especially in persons of a peculiar idiosyncrasy. (See art. Poisons, 428, *et seq.*).

181. *b.* There can be little doubt of *the injurious influence of the intemperance of the parents on their offspring*; and there is as little doubt that the

injurious effects are mainly evinced by the scrofulous diathesis thereby generated in the children, and developed either into external and internal tuberculosis in infancy, or into tubercular consumption in early or late epochs of existence. It is difficult to say in what sex or parent this vice is most productive of these maladies in the offspring. It is, however, evident that the female who addicts herself to the abuse of intoxicating liquors, and especially during pregnancy and lactation—and there are many both in the middle and lower classes who thus devote themselves and their infants to perdition—will bear an unhealthy fœtus, or one which will be imbued with the diathesis and seeds of disease just mentioned; and, if it live so long, will communicate a similar evil to its offspring. How efficiently are our legislators providing the incentives to the destruction of health, constitution, and morals, in the licenses and encouragements furnished throughout the kingdom to the abuse of intoxicating liquors! But what are these important matters, to the higher consideration, to them, of aristocratic interest, family patronage, and the influence of party?

182. Other causes besides intemperance may so affect the mother during the child-bearing period of life, and during pregnancy and lactation, as to favour the development of a scrofulous and tubercular disease in the fœtus and infant. Too low living, unwholesome meats, especially the too exclusive use of pork and bacon, anxiety of mind, and all the distressing and perturbating emotions, are more or less injurious to the offspring, and in the way just stated, more especially when conjoined with the other causes of ill health, which abound in all cold, low, humid and ill-drained localities; in crowded and ill-ventilated houses and apartments, and in crowded or close manufactories and manufacturing towns.

183. *c. The use of tobacco* in any way, either by smoking, snuffing, or chewing, is most injurious, especially in early life, and as respects its effects upon the constitution of the offspring, more particularly when either of these vices are indulged to excess by the male parent. Numerous instances have come before me of young men who have become habitual tobacco-smokers in early life, and who, having married, have either failed of having a progeny, or had children that could not be reared; or if they reached any of the early epochs of life, were subjects of tuberculosis in one or other of its forms or seats, and especially of tubercular consumption. (See Art. *Poisons*, 523, *et seq.*)

184. ii. The Causes of Tubercular Consumption that act chiefly during Infancy, Childhood, and early Life, or previously to Puberty, have been so fully discussed under Scrofula and Tubercles (§§ 30—64.) that very little is left for me to add at this place. The reader will find the several agencies arranged under this class considered at the place now referred to. There are, however, a few topics thus arranged which require notice, as being of some importance in a prophylactic point of view.—*A. Sleeping with very old and debilitated persons* is certainly prejudicial to the healthy, both in predisposing to tubercular consumption, and determining or developing the disease in those predisposed by a scrofulous diathesis or other influences. It may also be associated with other causes, and the results become more immediate and severe.

185. *B. Infection.—Emanations from the lungs and skin of persons, in the second or third stages of phthisis especially*, are certainly sometimes productive of consumption, more particularly in young persons of a scrofulous diathesis, and in those who are predisposed by other causes, or who are subjected to several concurring influences. The inhalation by the healthy of the emanations from the lungs and skin of the consumptive, and the consequent appearance of the disease in the former, may, as in other cases of infection, be productive of its injurious effects only in the circumstances now stated, but the disease is caused by infection nevertheless, although the fact is stated loosely by many writers as one of the propagation of phthisis by contagion, and denied by others, as indeed the infectious nature of nearly every disease has been denied by some, who consider belief in infection to be credulity, and scepticism to be a proof of a "strong minded" physician, or rather of an incredulous old woman. Although phthisis, in the circumstances favourable to infection, may be communicated to others, especially when the healthy sleep in the same bed or apartment with the sick, and although this result is, perhaps, more likely to occur in persons under or about the period of puberty than at a much more advanced age, yet for many years after puberty the person thus exposed and predisposed may be attacked; and this result is the more likely to take place in the cases of married, especially recently married, persons. I state this as the result of my observation; and, although the matter has been discussed from the days of Galen, and the occasional transmission of the disease by infection believed by him, by Riverius, Morton, Van Swieten, Narducci, Roncalli, Chavet, J. Frank, Hufeland, Hildenbrand, and many others, and denied by Salmade, Castallani, Portal, and numerous other writers, it still remains in dispute.

186. *C. Employments, exercises, amusements, and regimen previously to puberty.*—Sedentary employments, irksome occupations, and confinement in close or dark apartments, are more or less influential in predisposing to, or more directly occasioning, tubercular phthisis. The deprivation of out-door exercises and amusements, so requisite at this period of life to the development and strength of the constitution, and the congregation and confinement of numbers in ill-ventilated factories, houses or sleeping-apartments, blight the vital endowments of the frame; and of all the structures and organs, the lungs, like the leaves of a plant—both being the respiratory organs of their respective bodies—are the first to experience, and the most disposed to sustain injury. Nor are dress, night and day clothing, the influence of light, sunshine and temperature, at this period of life, undeserving attention as respects both sexes; for although either of these singly may appear of little importance, yet operating, as they often do, in combination, their effects on the general organisation are often remarkable. The frequent practice of leaving portions of the body uncovered by the dress, without reference to the weather and season, during the early periods of life; the very low temperature of sleeping-apartments during the winter season, in this and some other countries, whilst the confinement of the air by c

curtains around the beds causes the repeated respiration and consequent contamination of the air, thereby inducing feverish, restless and unrefreshing sleep, and a contaminated state of the blood, are amongst the most influential occasions of an imperfect development of the body at a period of life when all the aids to health and strength are most especially required. Not infrequently also other agencies are brought in co-operation with those just mentioned, and these too of no mean influence. Deprivation of light and sunshine—of the salutary influence of the sun's rays on the frame—not infrequently, especially when aided by the causes already noticed, produces an etiolation similar to that occasioned by this cause in plants; and, although the body grows in height, and the vessels extend in the direction of their axes, as in plants, yet the various structures are loosely, weakly and insufficiently formed, each one being deficient in tone, firmness and vital cohesion. Associated with this state of imperfect organisation, the blood presents a similar defect of assimilation, and an arrested development of the red-globules. It is thin, watery, and, although it may abound in colourless globules, or in those not yet metamorphosed into red globules, these last are very much diminished in number, or in their usual proportions. Nor should the mental depression, the irksomeness, the weariness of both body and mind, occasioned by the circumstances noticed under this category, and their effects upon the youthful constitution, be overlooked. These circumstances, when acting either singly, but protractedly, or in various combinations, exert their injurious influence primarily, although not always manifestly, on the lungs. These organs, although generally the first to suffer, are not always the first to indicate disorder. The functions of digestion, assimilation and nutrition often furnish the earliest indications of disease to the casual or superficial observer, but the experienced eye, and the informed mind, detect the antecedents of these, and carry the analysis of the morbid phenomena much farther, and until the agencies producing them are fully disclosed. (See Scrofula and Tubercles, §§ 39, *et seq.*)

187. iii. Causes operating during and subsequently to Puberty. — *A.* It is manifest that when the mental *studies* of the upper and middle classes of society, at this period of life, are pursued too far, or to the neglect of those amusements and exercises requisite to health, and to the proper development of the frame, pulmonary consumption will follow in a large proportion of cases, especially when the constitution is predisposed by original conformation, by the strumous diathesis, or by other causes acting in earlier life, or concurrently with this. If these studies are rendered still more injurious by stooping positions, or by pressure of the side against a desk, whereby the actions of the respiratory apparatus are hampered or confined within too narrow limits, the injurious effects will be more certain. But, where these latter causes are not present, others equally injurious may operate.; and these may either be too close cinctures of the lower regions of the chest, the pressure of unyielding, or insufficiently yielding supports in the stays worn by females; the use of steel supports, which conduct the electricity of the frame from the body into the air, and thereby deprive the nervous system of a salutary stimulus; and insufficient clothing on the neck, upper regions of the chest, and shoulders, or even the complete exposure of these parts without any clothing whatever, are not without their influence, either as exciting or concurrent causes, especially where a predisposition to this disease already exists. (See also art. Scrofula and Tubercles, §§ 57. *et seq.*)

188. *B. Trades, employments, and conditions of life* are conducive to pulmonary consumption when they prevent exercise in the open air; when they are followed in cold, low, close, humid, and dark apartments or situations, or in confined, bent, or cramped positions of the body, as by miners, &c. As to the comparative liability of persons pursuing different trades and occupations, no precise information has been furnished, as the number of persons occupied in each of these trades, in connection with the number attacked with phthisis, can rarely be obtained. It is manifest, however, from the researches of Drs. Guy and Lombard, that the deaths from this disease in those who follow in-door occupations are about double the deaths of those who pursue out-door employments. Shoemakers, tailors, milliners and dressmakers and other needlewomen, clerks and shopmen, weavers and glovers, compositors and printers, servants, bakers, &c., are amongst the trades most liable to phthisis. Beddoes stated that butchers are less liable to this malady than those following any other employment, and later observations have confirmed the statement. Dr. Trotter made a similar remark in favour of sailors, and this is rendered more obvious by the more liberal diet allotted to them now than formerly. Dr. Withering considered stable-boys, grooms, post-boys, and dragoons, less liable to phthisis than other employments, and such appears upon the whole, to be the case. The occupations in which dust and other irritating particles, whether mineral or vegetable, are inhaled into the lungs, are especially productive of diseases of these organs, and particularly of pulmonary consumption, bronchitis, asthma, and various complications of these, either with one another or with other lesions. But this subject, and the several topics connected with it, more especially with relation to the causation of pulmonary diseases, are fully considered under the head Arts and Employments as *Causes of Diseases*.

189. *C. The instinctive emotions and desires* are more important causes of tubercular phthisis than is generally supposed by either medical men or others; and this category of causes are most influential in young persons of a scrofulous diathesis, and in those who are otherwise predisposed, more especially by the causes already mentioned.—*a.* Premature or excessive sexual desires and indulgences, and still more the crime of self-pollution, are the chief of the class of causes in producing tubercular phthisis, and several other maladies. This crime, for it is no less than a crime, and one most severely, but not unjustly, punished by the Mosaic law when detected, is one more frequently practised by both sexes than may be believed by those who have not had occasion to inquire into the matter; and it is most prevalent in those who are sanctimonious and pharisaically censorious of others. The injurious effects of this crime are probably greater in the male than in the female,

especially in causing tubercular phthisis; and it is not improbable that the rite of circumcision among the Jews was instituted partly with the intention of preventing the excitement to the commission of it, that is liable to occur in the uncircumcised. Various mechanical contrivances for the prevention of the vice in females were employed from very early ages, and several of these adopted in the middle ages may be seen in museums of antiquities. No more certain means of exciting females to this vice can be supposed than riding. Instances have come directly to my knowledge of females having relinquished horseback exercise entirely on this account.

190. *b. Celibacy* may be viewed as a cause of tubercular phthisis, although the reason of its being a cause may not be obvious to many. It is, however, more generally known that the average duration of the life of bachelors is much under that of married men. This is mainly owing to the circumstance of their having become addicted to the crime of masturbation. A very large proportion of those who are thus addicted are impotent, and many of them are conscious of this fact, and do not marry; whilst others continue this vice in preference to sexual congress, and often pay the penalty by inducing this or other diseases. Several instances have occurred in my practice of persons having admitted, when afflicted with phthisis, or with any other of the maladies entailed by this vice, that they were conscious of the cause only when too late, and often when their minds and the powers of volition were too much weakened to resist the impulse to its commission. Even married men who had become addicted to it previously to marriage have continued it subsequently, as they have themselves confessed to me in several instances.

191. *D. Mental exertion and the moral emotions.*—*a.* Mental exertion, especially when prolonged or intense, is more frequently a concurring than an exciting cause, unless where an original or acquired predisposition to phthisis already exists. It is injurious chiefly about or soon after the period of puberty, when the frame, in all its parts, is not fully developed and consolidated, and when exercise in the open air, and in light and sunshine, which it often prevents, and which is requisite to perfect bodily organisation is neglected. This cause is often also heightened by the position of the body, especially by the stooping position, which during mental application is often too long retained.

192. *b.* The depressing emotions and affections, anxiety, longings after the objects of affection, either absent or lost, disappointments, losses of fortune or friends, &c., severely depress the organic or vital influence, impair digestion and assimilation, and predispose to, if they do not actually occasion, this malady.—*c.* Under this category may also be placed nostalgia in its various longings for early abodes, scenes and objects, and for the society of early or beloved friends. (See also Arts. DISEASE, *the Causation of*, §§ 22. *et seq.*, and SCROFULA and TUBERCLE §§ 61, 62.)

193. iv. CONTINGENT AND ASSOCIATED INFLUENCES OR CIRCUMSTANCES AIDING OR CONCURRING IN OCCASIONING PHTHISIS.—*A. Sex.*—According to the Registrar-General's returns, the deaths during two years and a half (1837, 8, and 9) in England and Wales from phthisis were 146,338, being 69,009 males and 77,329 females; and in 1847 the deaths from this disease were 25,083 males and 28,234 females. Mr. ANCELL says, that "from the Irish Reports, it appears that of 135,590 deaths from phthisis, 63,635 were males, and 71,955 females. In London, however, and in the large manufacturing towns, the proportion of deaths from phthisis in males and females was different. In London, from 1843 to 1846, the deaths were greater in males than in females, by nearly six per cent. According to the returns of 1847, the deaths from scrofula, tubes mesenterica, and hydrocephalus were 8105 in males and 6542 in females; and from phthisis 25,083 males and 28,234 females, thereby showing that, whilst the former scrofulous diseases were more fatal in males than in females, the latter, or phthisis, was more fatal in females by nearly six per cent. (5·9). In this country, therefore, it appears that females are slightly more liable to consumption than males. In the Metropolitan district, however, the deaths in 1838 from phthisis were 4057 males and 3630 females; and in 1839, 3749 males and 3355 females. The deaths in this district, in 1838, from phthisis were 7687, whilst in the southern counties, the population of which is somewhat greater, they were 5805.

194. *B. Age.* The several tubercular maladies present a greater or less frequency of occurrence at one epoch of life than at another. Tubercular meningitis and hydrocephalus are most frequent during infancy; mesenteric decline in early childhood, or about the period of weaning; external scrofula from the period of weaning till puberty; and phthisis from puberty until advanced age. The following abstract from the returns for 1845 and 1846 will show the deaths from phthisis, *in London*, at successive epochs of life:—

Years of Age.	Mortality from Phthisis at successive Epochs.			
	Males.		Females.	
	In 1845.	In 1846.	In 1845.	In 1846.
Under 5 years	354	234	316	269
5—10	88	88	114	92
10—15	69	61	107	104
15—20	191	219	214	228
20—25	343	387	349	362
25—30	405	450	426	434
30—35	436	456	379	383
35—40	431	454	328	401
40—45	379	397	279	305
45—50	312	346	218	211
50—55	240	234	133	135
55—60	155	179	97	99
60—65	111	104	72	60
65—70	73	66	46	48
70—75	21	36	16	15
75—80	9	14	9	6
80—85	4	1	1	3

195. In 1845 the deaths from phthisis *in London* at all ages, were 3624 males, and 3107 females; and from all causes, at all ages, 24,496 males, and 23,836 females; the deaths from phthisis being in both sexes 6731, and from all causes 48,332. In 1846 the deaths at all ages from phthisis were 3729 males, and 3161 females; and the deaths from all causes, at all ages, were 24,941 males, and 24,148 females; the deaths from phthisis, in both sexes, being 6890, and from all causes 49,089. From these returns it appears that the proportion of deaths from phthisis among persons advanced in age, the number of persons

thus advanced being considered, continues great to very mature age.

196. The following table is an abstract from a more extended one by Mr. ANCELL, which he has made from the Registrar General's returns for 1847, in which the deaths by phthisis, in all *England and Wales* at the several epochs of life, are stated and compared with the mortality by all causes, and with the number of persons living of the specified age in the middle of that year.

	Mortality from Phthisis.			Mortality from all Causes.			Estimated Population of that Age in 1847.		
Years of Age.	Males.	Females.	Both Sexes.	Males.	Females.	Both Sexes.	Males.	Females.	Both Sexes.
Under 1	1,251	1,164	2,415	49,547	39,237	88,784	215,150	234,959	450,109
1 to 2	676	656	1,332	16,666	16,019	32,685	230,463	230,038	460,501
2 — 3	318	345	663	8,900	8,513	17,413	233,383	235,187	468,570
3 — 4	212	212	424	5,870	5,803	11,673	217,806	221,556	439,362
4 — 5	179	182	361	4,123	4,137	8,260	215,225	215,026	430,251
5 — 10	780	876	1,656	9,768	9,369	19,137	1,020,042	1,022,576	2,042,618
10 — 15	910	1,432	2,342	5,101	5,330	10,431	942,534	915,115	1,857,649
15 — 20	2,294	3,232	5,526	6,615	7,126	13,741	836,845	865,094	1,701,939
20 — 25	3,521	3,899	7,420	8,241	8,324	16,565	774,342	888,360	1,662,902
25 — 30	2,983	3,683	6,666	7,216	8,190	15,406	657,138	722,120	1,379,258
30 — 35	2,373	3,094	5,467	6,626	7,623	14,249	604,706	646,972	1,251,678
35 — 40	2,212	2,545	4,757	6,833	7,387	14,220	465,847	482,871	948,718
40 — 45	1,847	1,903	3,750	6,909	6,917	13,826	466,338	486,047	952,385
45 — 50	1,534	1,404	2,938	7,135	6,462	13,597	345,472	349,380	694,852
50 — 55	1,261	1,111	2,372	6,981	6,684	13,665	328,848	351,469	680,317
55 — 60	1,025	874	1,899	7,615	6,982	14,597	202,956	217,199	420,155
60 — 65	749	715	1,464	8,703	8,725	17,428	223,801	247,912	471,713
65 — 70	515	505	1,020	9,220	9,323	18,543	129,311	149,231	278,542
70 — 75	253	246	499	9,935	10,782	20,717	111,365	129,120	240,485
75 — 80	128	109	237	9,357	10,552	19,909	59,546	69,089	128,635
80 — 85	41	26	67	6,651	7,799	14,450	33,295	42,745	76,040
85 — 90	9	10	19	3,487	4,380	7,867	10,770	14,881	25,651
90 — 95	2	3	5	1,006	1,571	2,577	2,062	4,333	6,395
95 et sup.	—	—	—	302	538	840	622	1,175	1,797
All Ages - -	25,063	28,340	67,964	113,076	207,901	420,977	8,368,914	8,755,174	17,124,088

197. *C. Diathesis and Temperament* predispose more or less to phthisis, but it is difficult to determine the extent to which they have this effect. It is even more probable, and more agreeable with experience, that original or early-acquired conformation of the body, arising from causes affecting the parents, has more influence in predisposing to phthisis than the temperament, as they have hitherto been described by physiologists, or conventionally admitted by medical writers. Temperaments are so mixed with one another, with diathesis, habit of body, and with states of vascular plethora, or its opposite, as to be rarely distinguished with precision, or to be viewed only as states of constitution, which every physician estimates conformably with his own views, although he may not be able to describe them with precision, or agreeably with the conceptions of others. I have nothing to add at this place to what I have observed above (§§ 9, *et seq.*) on this subject, and that is much less satisfactory to myself than I wish.

198. *D. Seasons, weather, and atmospheric conditions and vicissitudes*, have less direct influence in producing phthisis than has generally been supposed. They are, however, frequent concurrent and determining causes, and when they appear most efficient in occasioning this malady, they often act by producing catarrh, bronchitis, or pneumonia, either of which may develope quiescent phthisis, into a state of action, or call the latent predisposition into a more manifest form. Cold conjoined with humidity, especially when the already predisposed, or those not accustomed to these atmospheric conditions, are exposed to them, and sudden vicissitudes of cold, warmth, and humidity or dryness, or rapid alterations of these, are certainly powerful agents, especially in low situations, in developing phthisis. The rapid transference of terrestrial electricity into the atmosphere, during humid states of the air, has an injurious influence on persons predisposed to, or labouring under phthisis. The vicissitudes of temperature to which many expose themselves by passing from a very warm apartment into the cold external air, or from the latter into the former, and by sleeping in a chamber the temperature of which is many degrees below that of the apartments used during the day, are certainly more or less injurious to persons disposed to phthisis. In cold sleeping-chambers, although the body is protected by warm bed-clothes, the lungs are exposed either to a low range of temperature, or to a higher range generated by breathing the same air repeatedly in consequence of the confinement of the air by bed-curtains. No small injury is often also produced by over-exciting or over-heating the body, so as to produce copious perspiration, which often chills the surface, and throws the momentum of circulation inwardly, favouring pulmonary congestion, especially when the external surface is not protected by flannel next to the skin. Living in damp or ill-drained houses, removing into recently-built houses before the walls are quite dry, and living in those which are built on a humid or clay soil, without sunk areas around them, or without sufficient space for ventilation, are more frequent causes of disease, and especially of pulmonary consumption, than they are generally supposed to be, especially in persons of a scrofulous diathesis, or otherwise predisposed.

199. The influence of *seasons* on phthisis is but slight, and almost undetermined. Medical statistics give very little information on this topic, and that little is deficient in precision. The returns of the Registrar-General furnish no data respecting it, for the deaths from phthisis during the four quarters present little difference as to numbers; and when the very remarkable differences of duration presented by this disease are considered, it cannot be expected that the deaths can be an index to the seasons in which the malady was occasioned.

200. *E. Climate and Localities.*—*a.* As to the climate of different countries, and as to the influence of situation and locality, either in favouring or in preventing the prevalence of phthisis, our knowledge is altogether imperfect. Much that has been asserted on this subject is more or less inaccurate, the inaccuracy being often in proportion to the dogmatism with which the matter is treated. That some climates and localities present a much greater prevalence of this disease amongst their inhabitants than others is an admitted fact; but the degree of prevalence, or the amount of influence attributable to climate only, and the shares which may be imputed to situation, circumstances, habits, customs, &c. of the inhabitants, especially the natives, are either very imperfectly known, or not known at all; even at the best an approximation to the truth only is to be expected. Several writers have stated that pulmonary diseases, and more especially consumption, are rare within the tropics, and in the natives of these countries particularly; but Dr. Webb states that the "records of cases of natives of every part of *India* show that phthisis and pulmonic affections are at least not uncommon diseases among natives of India, and only yield in frequency to fever, cholera, and dysentery, presenting every form and variety that is to be met with in any other part of the world." Dr. Greig states that pulmonary consumption is a prevalent disease in the lower provinces of Bengal; and Dr. Webb, who quotes this statement, remarks that he has himself "observed the disease extensively among the Hindoo race, and the Puharrees inhabiting the lower belt of the Hymalya range of mountains." The same writer refers to Dr. Godsve's report of the prevalence of pulmonary disease in *Upper India*; wherein he states—"tubercular phthisis we have had abundance of, as the detailed autopsies forwarded every month show." (Webb's *Pathologia Indica*, p. 100. *et seq.*)

201. *b.* Dr. Archibald Smith, in some valuable communications he kindly sent me respecting the diseases of *Peru*, remarks that "In the negro hæmoptysis is less frequent, perhaps, as a symptom of phthisis, than it is of disease of the heart or aneurism of the aorta. Hæmoptysis is also very often observed in the congestive stage of fever in the Peruvian negro; but with the fever the sanguineous sputa disappear. Comparatively speaking, phthisis is decidedly less common in the negro than in the cross between the negro and Peruvian Indian, or pure Indian bred in the mountains, but migrated to the coast. The mixed races with preponderating Spanish type or blood, constituting the creole white race, nurtured in luxury, idleness, and pleasure, and consequently with an unhealthy physical and moral training, are delicate and feeble of organisation; and therefore, of all the different races, the most prone to ailments and failing health, and also most subject to tubercular consumption. In the *purely* white race phthisis is comparatively rare, except among such youths as are sent from Europe with pulmonary complaints. But, as these are found in mercantile establishments, they are usually sent from one station to another, without trying the benefit of mountain air; for in the mountains there are few European mercantile establishments. In 1792 Lima contained 52,000 inhabitants, of whom 20,000 were whites, 23,000 of the negro race, 6,000 of the cross of white and Indian, and 3,000 only of the pure Indian. At that period the races were treated in their respective hospitals. The whole deaths by hospital and parochial returns were 2795 for the year given. From the *white* hospitals 650 dead were buried, while 692 died in the negro and Indian hospitals; thus showing a much greater mortality among the whites in general (including the creoles). Now, rest assured that phthisis always maintained its relative position among the causes of death next to fevers and dysentery. In the Indians on the coast the relative mortality is far beyond that of the negro. In Lima phthisis and intermittent fevers are less common in the negro than in the white and Indian races. But diseases of the liver, of the heart and aorta, and of the gastric and intestinal viscera, especially dysentery, commit more havoc in the negro and other dark members of this family, than among the other races."

202. In other parts of *South America* the occurrence of phthisis appears to be infrequent, especially among the unmixed dark races; but the information respecting these parts and races is very defective. In *Mexico* this disease is said to be rare; as respects the city of Mexico this may be owing to its high position above the level of the sea, and to other circumstances; but no information is furnished as to the comparative immunity of different races in this country. According to Dr. Hancock phthisis is almost unknown on the coast of *British Guiana*, and very rare in the mountains. This immunity must have reference chiefly to the native races, as instances of death from phthisis have occurred among both whites and blacks who have removed to that country. Col. Tulloch states that in St. Helena the mortality of the population from diseases of the lungs is about 3·2 per 1000 annually.

203. *c.* Upon reference to my notes respecting the diseases of those parts of the *west coast of Africa* which I visited and resided in for short periods many years ago, and which were inhabited almost entirely by true negro tribes, individuals of the white, Arab, or Moorish races being very few, I find it stated that phthisis, remittent and intermittent fevers appeared very rarely to occur among the former; but when they migrated to somewhat colder climates, even to the West Indies, phthisis was sometimes observed among them; and this became the most fatal malady to them, excepting small-pox, when they were sent to temperate or cold climates. Although dysentery and chronic diarrhœa were amongst the most prevalent and fatal maladies among negroes in those parts of Africa, yet the liver appeared less frequently diseased than the spleen in this race; and much less so than in the purely white and mixed races. Amongst negro children, however, I remarked that mesenteric disease was not uncommon.

204. *F. Race.* After considering the distribution of heat over the globe as displayed by the isothermal lines of Humboldt (see Art. Climates), and by the later researches and illustrations of Professor Dove, I infer that less is owing to temperature than to *race* and modes of life in the causation of phthisis. There are numerous circumstances which concur with temperature in producing a climate either favourable or unfavourable to the prevalence of phthisis; and of these coldness and humidity of the air, low elevations from the surface of the ocean.

sudden and frequent vicissitudes of temperature and weather, are amongst the most influential elements of a climate which favours the production of this malady; whilst a moderately warm and dry atmosphere, considerable elevation above the sea, especially in warm countries, and regularity of season and temperature and weather, greatly diminish the prevalence of the disease, and favour recovery in the early stage of the malady. But these conditions, favourable and unfavourable, are so associated with numerous other agencies, especially with the influences of race, of social and domestic conditions, of food, habits, and modes of living, &c., that it is impossible to determine the amount of influence which may be ascribed to each.

205. There can be no doubt, however, that the disposition to phthisis existing in different *races or varieties of our species* should be viewed in very intimate connection with the climates in which they reside, and with the food and modes of living adopted by them. Having ascertained the frequency of the disease in the aborigines of a country or climate, it is next of importance to know how far that frequency may be modified — diminished or increased—by change to other countries, either colder or warmer, or of higher or lower elevation, &c., and by the adoption of different food and other habits. Our knowledge of these subjects is deficient, and the difficulties in the way of improving it are many; but, before I endeavour to draw a few brief inferences closely connected with it, I shall succinctly notice such information as I have found calculated to remove a few of these difficulties. Several of the most important topics connected with this subject, and more especially in connection with pulmonary consumption, are discussed in the Article Climate, to which I must refer the reader.

206. In countries in which the isothermal lines of annual temperature range from 70° to 85°, phthisis appears to be rare among the aborigines; but it is more or less increased in frequency in mixed races, and in those who have migrated from very warm to cooler districts, or from a dry and elevated situation to low and humid localities; but the amount of increase under these circumstances cannot be shown. *Upper Egypt* and other parts of *Northern Africa*, and those places in *Western Asia* where the annual range of temperature is not much above 75°, or below 65°, phthisis is very infrequent, although numerous circumstances combine to occasion external tuberculosis, especially in children, and probably also mesenteric disease; and of these circumstances the most influential are evidently insufficient and unwholesome food, and want of cleanliness. The immunity of these countries, more particularly of Egypt, from phthisis, was well known to the ancients from the days of Aristotle; and hence this country was recommended by them as a place of residence for consumptive patients. It is stated by Chardin, Fryer, Kaye, Kerns, and others, that consumption is seldom observed in *Syria* and *Persia*; and MM. Broussais, Boudet and other French writers remark that phthisis is rare in the natives of *Algiers* and of the *Barbary Coast*, the mean annual temperature varying from 68° to 72°. The former of these writers observe, that in Algiers, where periodic fevers prevail, of 40,000 cases in the French army only 62 were consumptive; and that the deaths from this disease were 1 in 102, while in the army in France they were 1 in 5. In the *West India Islands* the annual mean temperature varies from 75° to 80°. The statements respecting the prevalence of phthisis in these islands vary remarkably, and are often contradictory; but upon the whole it appears that this disease is not infrequent among the dark races, especially negroes who have been brought from Africa, and among creoles. Drs. Musgrave, Davy, and Hunter say that it is rare among the indigenous inhabitants. The reports of Col. Tulloch give five deaths from disease of the lungs annually in 1000 of the population in Jamaica; and a greater mortality from phthisis among white troops stationed in these islands than in their own country, but a much less mortality when stationed in the East Indies.

207. The *East Indies* furnish a variety of climates, according to latitude, elevation above the level of the sea, and the other elements constituting climate (see Art. Climate.). The annual isothermal lines vary accordingly from 66° to 82°; and although cases of phthisis amongst the native races are not rare, especially in the jails and other places, where several causes concur with race and climate in occasioning the disease. According to the accounts furnished by Stewart, Jackson, Balfour, Sykes, and others, it appears that external scrofula and phthisis occur, especially the former, in the several races in the East Indies, but in very different degrees of frequency. The writers on this subject generalise from very limited sources of observation, in respect both of climate and race. It is, however, agreed that tuberculosis, both external and internal, are most prevalent in the half-castes, or cross between the whites and natives. Col. Sykes states that in 267,456 cases of all diseases treated during five years at the dispensaries in *Bengal and North-West Provinces* there were 115 cases of external scrofula and three deaths, and 187 of phthisis and nine deaths; thus showing a low rate of tuberculosis in the natives of India. Dr. Balfour states that phthisis is very rare in the natives serving as troops in the *Madras* Presidency, the deaths annually from this disease being only ·4 or ·3 per 1000. It should not, however, be overlooked that negroes, when removed either to the West or East Indies, are more liable to phthisis than in their native countries.

208. As to the frequency of phthisis in *Madeira* accounts are most contradictory; some writers stating extreme opinions on the subject. Upon the whole it appears, that the disease is not infrequent among the natives, and that it is even common among the lowest class. In *Malta*, in *Italy*, *Spain*, *Portugal*, *Greece*, *European Turkey*, and southern parts of *France*,—in all the places to which consumptive patients are so often sent from this country,—the disease is more or less prevalent; generally as frequent in all these places as in this country, and in some even more frequent. M. Andral states phthisis to be very prevalent in the Mediterranean Archipelago. Mr. Spencer Wells says that one-third of the deaths at the Royal Naval Hospital in Malta was from this malady; Dr. Burgess, Lugol, Andral, Merryon, and others, phthisis is most fatal, especially in certain localities, both in *Italy* and *France*; and of these Orleans, Rheims, Montpellier, Marseilles, Nice, Rome, Naples, &c., are not the

least remarkable. Mr. Ancell gives the following table of the ratio of deaths from phthisis to all deaths in the civil and military hospitals of these countries:—

Leghorn .	Civil and military .	1 in 10·75
Florence .	Civil	1 in 11·5
Rome		1 in 3·4
Naples . .	Average of three hosp.	1 in 2·33
	Military	1 in 3·85
Paris . .	Civil	1 in 3·25
	Military	1 in 12·2

In Marseilles the deaths from this disease are stated to be one in four, in Naples one in eight, in Nice one in seven; but these can be viewed as approximations only to the truth. There can be no doubt that, even omitting the deaths from other tubercular diseases, those which occur from tubercular consumption among the inmates of children's hospitals or institutions, and those brought up in these institutions, are even greater than any just noticed in either of these cities. Dr. Caspar of Berlin gives the following table of deaths from phthisis in different cities in Europe and the United States, the average being about one in six:—

Berlin dur.	10 yrs.	1 death fr. phthisis	in 5·7 deaths
Paris .	4	1	5·5 .
London .	2	1	6·2 .
Hamburgh	3	1	4·6 .
Stuttgardt	10	1	4·7 .
New York	11	1	5 .
Philadelphia	7	1	7·7 .
Baltimore	8	1	6·7 .
Boston .	7	1	5·9 .

In *Belgium* and *Holland* phthisis is quite as prevalent as in England and France. In *Sweden* the deaths from this disease are said to be about one in nineteen of all deaths. Dr. Gellerstedt remarks that the mortality from this malady in the military hospitals in Stockholm is eight in 1000, and that the life of a soldier is favourable to the production of phthisis, which he believes to be on the increase in Sweden. According to a writer in the British and Foreign Review, this disease is rare in *Denmark*, and still rarer in *Norway*, *Lapland*, *Iceland* and the *Feroe Isles*. In *Canada*, notwithstanding the severity of the winters and sudden alterations of temperature, the air being dry, tubercular maladies, and especially phthisis, are comparatively rare. In *Russia* this disease is much less frequent than in the southern countries of Europe, although both Sir A. Crichton and Sir G. Lefevre state that external scrofula is very prevalent, especially in St. Petersburg and Moscow, and remark that those who bear about them scars from scrofula are supposed to be exempt from phthisis.

209. "In the *Southern Temperate Zone*, between the isothermal lines of 40° and 70°, comprising the southern part of South America, the Cape of Good Hope, with a portion of South Africa, nearly the southern half of Australia, Van Diemen's Land, and New Zealand, all accounts lead to the conclusion that tuberculosis is much less frequent than in countries situate to the north of the northern tropic." This comparative immunity is owing to the remarkably less liability of the native races to the disease, and to the general dryness of the air, notwithstanding the sudden vicissitudes of temperature. Other conditions, either not known, or imperfectly appreciated, may also concur to produce this result. In many parts of Australia, however, the quantity of dust so frequently floating in the air, during the hot and dry seasons, in some measure counteract the other beneficial influences of the climate as respects phthisis.

210. From the statistical information which has been furnished respecting the prevalence of phthisis in different parts of the globe, and which may be consulted in the works referred to hereafter, the influences of race and of the food adopted by races and by the inhabitants of different countries, are not sufficiently considered, or are even altogether overlooked. Although statistics may nevertheless furnish much that is important on this subject, yet there are other circumstances besides these which have not been taken into the account. Of these not the least important are, the influences of religious institutions and rites; of the states of social intercourse; of modes of living and of warming apartments, in cold and in temperate countries; the effects of the soil, of vegetation, of water, and of the emanations from them. Of the agency of these, either in favouring or in counteracting the prevalence or frequency of phthisis, our knowledge is very deficient.

211. From the imperfect information furnished by statistics and by other sources of knowledge, and from what I have stated under Climate, I venture the following inferences as comprising most of what is known of the influence of climate, and of its more important effects, in causing tubercular consumption. — *a*. Phthisis is more or less prevalent in the northern temperate zone, especially in the countries of Europe and the United States of North America.

212. *b*. This prevalence is most remarkable in the Caucasian race, and in the crosses of this race with any other, more especially with the negro and other dark races.

213. *c*. The natives of countries to the northward of the temperate zone are rarely affected with phthisis while they reside in these countries and continue the habits and modes of life — of clothing, lodging, sleeping, living, and feeding — which are generally adopted by them; but when they are removed to more temperate climes, and adopt the habits and modes of life of these climates, they evince a manifest tendency to phthisis, which is probably heightened by the nostalgia to which they are subject when removed from their native countries and from accustomed pursuits, habits, &c.

214. *d*. The negro and dark races inhabiting intertropical countries, and the dark races peopling the islands within the tropics, and those in the southern temperate zone, are rarely subject to tubercular consumption as long as they remain in their native countries and islands, and continue their usual habits and modes of living; but the offspring from a cross with the Caucasian race, especially when they remove to a temperate or cold and humid climate, and still more these native races when they migrate to such a climate, are even more liable to phthisis than the inhabitants of temperate countries.

215. *e*. The immunity of the natives of the countries to the north of the temperate zone from phthisis is mainly attributable to their active vocations in the open air, to the nature of their food,

and its adaptation to the temperature and climate, to the general dryness of the air, to the warmness of their clothing, whereby the skin preserves its depurating functions, and to the warmth of their sleeping places. (See Climate, §§ 24, *et seq.*)

216. *f.* The immunity, or comparative immunity, of the negro and dark races from phthisis while they reside in their native countries, is chiefly to be attributed to their outdoor modes of living and exercises, to the adaptation of their food to high ranges of temperature, to the influence of miasmatous districts in counteracting the tendency to tubercular consumption, and in no small measure to the increased functions of the skin in these races; these functions being in them more decidedly supplementary of those of the lungs and liver,—more actively depurative of the blood than in the white race. (See Art. Climate, § 22.)

217. *g.* The greater liability of the dark-skinned races to phthisis when they migrate to a temperate or cold climate, is mainly attributable to the asthenic diathesis of these races, to the depressing influence of cold, especially in cold sleeping apartments, upon the vital condition of their lungs—to the blight which a low range of temperature produces upon the organs of respiration; to the change in their habits, modes of living, food, &c. The proclivity of cross-breeds to this malady is partly owing to the causes just stated, in connection with their indolence, their debauched habits, their venereal excesses, and indoor occupations—if occupied at all. The dark races and mulattos, when they migrate to countries whose annual range of temperature is much below that of their native climates, are disposed to congestive or asthenic inflammatory affections of the lungs; in which, owing to the low grades of vital power and vascular action, the morbid exudation is incapable of the usual changes consequent upon sthenically increased vascular action; but, instead, assumes the tubercular form, or that state which is incapable of organisation, and equally incapable of absorption, and which undergoes the alterations characteristic of tubercular matter.

218. *h.* The Mongolian race, especially as typified by the Chinese, does not appear to be more liable to phthisis than the natives of the northern provinces of India and of the countries in Asia between China and Europe. Of the Chinese, as well as of these latter countries, our knowledge is very imperfect as respects the relative prevalence of disease. But from what I can learn, tubercular phthisis is not a prevalent disease among them, at least as long as they remain in their native climates and pursue their usual occupations, habits, and modes of living. How far the various races and tribes inhabiting these vast regions may be liable to this malady when they migrate to either colder or warmer countries, is not known; but the results must manifestly depend upon the many circumstances attendant and consequent upon such migration.

219. *i.* The food of man increases the disposition to phthisis in as far as it is not adapted to the constitution and wants of the races in their native countries—to the different races inhabiting cold, temperate, and tropical climates; to each of which it requires to be appropriate in its nature, as shown in the article Climate (§§ 26, *et seq.*). This adaptation of food to race and climate extends to the beverages used by the inhabitants of different countries; the neglect of this principle of Hygienne being demonstrated by the destructive effects of ardent spirits in the dark-skinned races, which are so little injurious to the natives of cold countries.

220. *k.* The influence of clothing upon the frequency of phthisis requires, equally with food, a reference to race; and the considerations which apply to the one appear in great measure to apply to the other. In all races the clothing, and in the dark races the inunctions of the skin, in addition to the slight clothing required by the vicissitudes of season and weather, tend to promote the regular discharge of the cutaneous functions; the fair-skinned races of Europe and America being those in which these functions are least active in health, and most liable to interruption.

221. *l.* Religion and religious rites may be viewed by many as exerting no influence on the frequency of phthisis or of any other disease in any climate. I believe, however, that religious rites exert some influence, but the extent of that influence I cannot state; indeed, it would be impossible to ascertain it, especially in Mohammedan countries, and in countries to the eastward and the north of the former. There can be no doubt, however, that the strictness of diet, and the rites of the Jews, notwithstanding several countervailing influences to which they have been exposed during many centuries, have rendered scrofula, phthisis, and gout less frequent among them than among other peoples in their vicinity (§ 178.).

222. *m.* In our estimates of the influence of climate on the frequency of phthisis in the white races, a cold moist climate, and low situation, and without being miasmatous, or a variable and humid climate, is the most favourable to the production of this disease; whilst a dry, temperate, and moderately elevated situation, with a regular procession of the seasons, or a limited range of temperature, is that which is most likely to diminish the frequency or arrest the progress of the malady. Other considerations connected with climate will be entertained when the prevention of phthisis is discussed.

223. *G. Confinement in prisons, barracks, hulks, workhouses, hospitals, and expatriation*, &c., are severally productive of phthisis, both in the predisposed, and in those who have evinced no marked predisposition; but in the former most especially. In prisons, hulks, and workhouses several injurious influences, physical and mental, combine to produce a more or less marked effect. Insufficient ventilation and exercise in the open air, want of light or sunshine, deficiency of external warmth, low grades of temperature, conjoined with humidity, low and moist situations, and insufficient or unwholesome food, generally combined with depression of spirits, longings after liberty, and weariness of prolonged or hopeless confinement, are the frequent causes of phthisis among the inmates of these places. Dr. Baly states that, in a period of eighteen years in the Milbank Penitentiary, nearly half the deaths and half the pardons on medical grounds were due to tubercular disease, the frequency of this disease progressively increasing after a few months' confinement; and the ratio of mortality in this prison being nearly four times more than that of the metropolis, as regards this malady. Dr. Baly has further shown that a similar increase of phthisis

among prisoners occurs in other places of confinement, both on the continent of Europe and in the states of North America. Dr. Allen Webb remarks, on the authority of Dr. Green, that in the jail of Midnapore, in Upper India, in 22° 30″ north latitude, and 87° 25″ east longitude, and in the Calcutta prison, phthisis frequently occurs, although in a hot climate, where this disease is but slightly prevalent. In these intertropical prisons the malady often follows attacks of pneumonia, or it assumes the acute and febrile form, or that described as most common in children (§§ 92, *et seq.*).

224. Many of the conditions existing in prisons are, to some extent, present also in *barracks* and in *workhouses*. According to the *Army Reports*, the British foot-guards are much more liable to consumption than the general London population; and in most stations, both in temperate and in warm climates, the mortality from phthisis in barracks is much greater than among the officers or the general population of the country. As respects the guards, something may be owing to the height of the men, tall men being more frequently predisposed to this disease than those of middle size; but much more is certainly owing to the congregation of numbers in a limited space, to the irregularities and vices of a barrack life, and to the influence of a vitiated atmosphere. The results are similar, and often more remarkable, in large public or private schools, where a large number sleep in one apartment, and breathe repeatedly the same air.

225. Confinement in *workhouses* and *hospitals* is injurious chiefly by inducing tubercular disease, in some form or other, and especially in that of phthisis. In the hospitals for children this is especially the case, as shown by MM. Rilliet and Barthez. The continued respiration of the air of an hospital or workhouse, without removal from the wards or apartments into the open air, is even more injurious than breathing a more impure air than that in these places, when exercise in the pure open air is enjoyed during the day; the continued respiration of even a slightly impure air being more injurious than the respiration after intervals of a much more vitiated atmosphere. The impurity of the air in these places is caused by the numbers breathing the same air in a confined space, by the exhalation from the bodies of the inmates, and by the effluvia proceeding from diseases, morbid discharges, &c. Infants of women confined in lying-in hospitals often become generally tuberculous if they remain long in these places, as I have observed on several occasions when consulting physicians to one of these institutions.

226. *Expatriation*, either by transportation for crimes, or by emigration, unless the climate to which expatriation takes place be dry and temperate, is generally followed by an increase of mortality caused by tubercular consumption. Even removal from the high lands and from the scenes of early youth to the low and humid situations in the same latitude, although the temperature be milder, causes an increased disposition to phthisis. This is partly owing to the mental emotions consequent upon the removal so frequent in young persons thus circumstanced, and is greatly increased by the nostalgia produced in these instances (§ 213.).

227. E. *Poverty, and the vicissitudes of fortune and of life* have no mean influence in both predisposing to and exciting tubercular consumption. MM. Lombard, D'Espiné, and Lebert have furnished sufficient evidence that this malady is much more prevalent among the poor than among the middle and highest classes of society. M. Lombard states that the combined statistics of phthisis in Vienna, Paris, Hamburgh, and Geneva, show that the disease is doubly more prevalent among the poor than in the higher classes. Every competent observer must have remarked the occurrence of phthisis after the loss of fortune, honour, and friends, and have seen mental depression, conjoined with poverty, slowly developing this disease in its most irremediable form, in all temperaments and constitutions, and even independently of hereditary or other states of predisposition. (See also §§ 170, *et seq.*).

228. v. Pathological Causes of Phthisis. — Previous disorder or disease more frequently both predispose to and directly occasion tubercular consumption than is commonly supposed; and the effect is produced not merely by calling the tubercular germs into activity where they already exist, but also by causing their formation and progressive development where no evidence either of a tuberculous diathesis or of their existence had been previously detected. If we endeavour to trace the pathological changes as they successively occur, and remark their nature, from those characterising the previous disorder, to those which interpose between that disorder and those which constitute the incipient stage of phthisis, we shall be especially struck by the influence produced upon the vital and constitutional powers by the disorder, although apparently slight, which has occasioned this malady. Several of these disorders are so insidious, and others of a more important nature are in some cases so mild, as not to excite any apprehension as to the effects they may produce, and thus they are allowed to proceed, or are exasperated by exposure and neglect of proper treatment and regimen, until the changes or states which either indirectly lead to tubercular deposits, or directly produce them, more or less fully supervene. In other cases severe attacks of disease, either inflammatory or exanthematous, are injudiciously treated or neglected towards and during convalescence, owing to the desire of the patients or their friends to get rid of medical attendance; or are imprudently or prematurely exposed to the various internal and external causes of disease, and especially to those which in such circumstances more particularly depress organic nervous power, disorder digestion and assimilation, and blight the vital functions of the respiratory organs. During convalescence from epidemic and exanthematous maladies, and from inflammatory affections of the respiratory passages and organs, the patient is often left, by his own self-will and ignorance, without those means which are required to restore his exhausted vital energies, to renew the vigour of the organic nervous system, to improve digestion and assimilation, and to promote the healthy metamorphosis of the colourless chyle globules into the red globules of the blood. In many diseases, and especially in exanthematous and other fevers, the waste of the hæmatoglobulin is progressive, and at the period of incipient convalescence it is generally greatest, and

the blood is then poorest and most deficient in red globules. Now, if these states of exhausted organic nervous influence, and of impoverished circulating fluids, be not improved by judicious treatment and regimen, or by change to a healthy air, &c., and more particularly if they are influenced by injurious exposures or agents, digestion, assimilation, and nutrition are liable to be perverted, and tubercular germs are thereby rapidly developed, or are directly or primarily produced.

229. *A. Previous disease of the respiratory and circulating organs* has no mean influence in predisposing to, or in directly occasioning phthisis. Frequent attacks of catarrh, catarrhal fever, influenza, hooping-cough, bronchitis, broncho-pneumonia, pneumonia, &c., are severally calculated to develope phthisis, particularly in the scrofulous and lymphatic diathesis. In these diseases the evil is not always to be ascribed to the development during their course of the germs of tubercle which had previously existed, but to the primary formation of these germs or deposits during their progress and decline, or their periods of decadence, constituting the early stage of convalescence. In this stage excited action has subsided into more or less of exhaustion, vital power is locally or generally impaired, the circulating fluid somewhat wasted as respects its most assimilated elements, and the digestive and assimilating functions considerably weakened. Diseases of the heart, especially valvular diseases, causing either congestion of the lungs or hæmorrhage from the bronchial tubes, have also no mean influence in developing phthisis; for the congestion thus occasioned is not unfrequently productive of an exudation either into the air cells or into the parenchyma of the lungs, which passes into the tubercular form, or is converted into or becomes the nidus of fully developed tubercles. Similar results may also follow the exudation of blood from the bronchi, especially if the fluid pass into the air cells.

230. *B. Exanthematous diseases* are often followed by phthisis; and this latter malady is more likely to originate during the decline of these diseases, or in their early and advanced stages of convalescence, than at an early period. Of all this class of diseases there is none that is more productive of phthisis, or more rapidly developes it, where the germs of the malady already exist, or where a predisposition to it is present, than *measles*, and this is more especially remarkable in persons about or above the age of puberty. I have often observed persons who, by diathesis, hereditary predisposition, or other circumstances, were possessed of a consumptive tendency, pass through measles without any marked pulmonary complication, or any pulmonary disorder that could be detected by auscultation or otherwise, and yet, during the progress of advanced convalescence, or soon afterwards, indications of incipient phthisis have appeared, especially if any exposure or want of care had favoured the development of the malady. In this, and in others of the exanthemata, the decadence of the disease, and the consequent convalescence present, as just stated, the most favourable occasions for the origination of phthisis, and these should be carefully guarded against.

231. Of all the exanthemata, there is none so unfrequently followed by phthisis as *smallpox*. It would appear that this latter malady either carried off most of those predisposed to phthisis, when smallpox was a more prevalent disease than it is now, or it destroyed the predisposition to phthisis. I have long remarked, and I believe that others have also remarked, the very rare occurrence of phthisis in any one even but slightly marked with smallpox. It is manifestly otherwise with *vaccinia*, for what I have stated with respect to its influence on the frequency of Scrofula (§§ 47—49.), is equally applicable to phthisis. It does not appear that *scarlet fever* is influential in producing or developing phthisis further than that the debility consequent upon it, during convalescence, requires a careful protection from exposures and other exciting causes of this latter malady. Scarlet fever is often attended or followed by enlargement and suppuration of the glands of the neck, especially in scrofulous subjects; and in these cases, as well as in other scrofulous cases, when these glands suppurate, the liability to tubercular consumption is thereby greatly diminished.

232. *C. Suppressed or excessive secretion or excretion* is often more or less concerned in occasioning phthisis. The suppression of an accustomed evacuation or discharge, or the drying up of an issue, seton, or ulcer, or the healing of a fistulous ulcer, as *fistula in ano*, has been followed by phthisis; but in all such cases as have fallen within my observation the disease had commenced previously, or had even made some progress; the suppression of the discharge, especially of hæmorrhoids or the catamenia, or of the cutaneous excretions, having been followed by a more acute form of the disease, or having developed a chronic, or slow and insidious state of phthisis, into the congestive, inflammatory, acute, or hæmorrhagic, according to the diathesis or habit of body of the patient.

233. On the other hand, excessive discharges, whether hæmorrhagic, secretory, or excretory, may so weaken the constitutional powers—may so depress organic nervous energy and impoverish the blood, by wasting its hæmato-globulin, as to be followed by tubercular phthisis, either where a predisposition to it already existed, or where causes tending to blight the vital condition of the lungs were in operation, as cold, humidity, &c.; excessive losses of blood, by operation or from hæmorrhoids, from menorrhagia, flooding, &c.; prolonged or improper suckling, diarrhœa or dysentery, cuteric fevers, masturbation, and venereal excesses,—have severally not infrequently either caused or developed phthisis, especially where a predisposition to it was present.

234. *D. Impaired organic nervous or vital power*, or debility, whether hereditary, original, or acquired during childhood, youth or maturer age, is more intimately connected with the occurrence of phthisis than is generally supposed, and is directly concerned with the causation of the impaired conditions of digestion, assimilation, and nutrition, which constitute a large portion of that circle of morbid actions characterising the commencement and early stage of tubercular consumption. (See Debility.)

235. *E. Morbid state of the circulating fluids*, both the chyle and blood, that are so often present at an early stage of phthisis, or even before this

state has manifested itself, are the first results of impairment of the organic nervous power; and although comparatively rarely declared in the form of anæmia or chlorosis, yet they consist of a greater or less deficiency of the hæmato-globulin, and especially of the red globules, with an excess of the colourless globules, and a weakened crasis or diminished vital cohesion of the fibrin, and consequently of the coagulum.

236. VIII. OF THE OPERATION OF THE CAUSES OF PHTHISIS. — *Phthisis*, whether hereditary, congenital and proceeding from causes affecting the parent, or produced by causes acting during early or mature age, generally arises from a concurrence of causes, one or more of which may be much more effective than the rest; they may act either contemporaneously or successively, or the influence produced by one or two may be reinforced or determined by others acting subsequently.

237. i. The causes, then, either affecting the parents, and the offspring through them, or the individual only during early childhood, or subsequently, in the many modes of combination or succession that most necessarily arise from their numbers, are of such natures as to impair vital power, especially as manifested by the organic nervous system, and by the organs and functions endowed by this system.

238. ii. As this system actuates the vascular system and the blood, and as it influences also the digestive, assimilating, and nutritive functions, the secretions and the excretions, so it necessarily follows that causes which depress or exhaust, or otherwise impair the influence or power of this system — the organic nervous — will co-ordinately affect the states of the assimilating functions, of the blood, and of nutrition.

239. iii. The following may thus be inferred as the successive or morbid phenomena resulting from the action of the causes of phthisis, whether occurring singly or in various combinations, or in succession: 1st. Depression of the organic nervous or vital power of the frame, or an imperfect development of this power, owing to hereditary or congenital, or to more immediate or direct causes operating in early or advancing epochs of life; 2nd, Morbid states of the circulating fluids, especially of the chyle and blood, commencing with the slow or imperfect development of the chyle globules, and followed by a slow or impaired metamorphosis of these and the blood globules, or of the former into the latter, — the plasma or *liquor sanguinis*, with its fibrine, being deficient in vital endowment; 3rd, A wasting or diminution of the red globules, and an impairment of the crasis or vital endowment of the plasma by excessive secretion and excretion from the lungs, skin, and bowels; 4th, The nutrition and vital cohesion of the tissues — the organisation of the frame ultimately suffers.

240. iv. These changes in the organic nervous influence or vital power, in the circulating fluids, and in the nutrition of the structures, produced by the causes of phthisis, may take place contemporaneously and co-ordinately; but they may more reasonably be supposed to advance in succession, however rapidly, impaired organic nervous power accelerating and increasing the other subsequent changes. That this procession of morbid changes actually obtains may be inferred from the modes in which the causes may be presumed to operate; for those causes which primarily and chiefly affect, by depressing or impairing, or imperfectly developing, organic nervous power, as hereditary influence, the depressing emotions of mind, &c., may rationally be presumed to operate consecutively, and to no slight extent also impede and disorder digestion, assimilation, and the healthy metamorphosis of the chyle and blood globules, and ultimately the nutrition and vital cohesion of the tissues. Many other causes which more directly tend to prevent the development of the chyle and blood globules, or to promote their waste or destruction, as insufficient food, increased discharges, &c., depress organic nervous or vital power, while they impair or arrest nutrition. Certain causes, again, exert a still more extended influence; for they act directly and manifestly, both by depressing or exhausting vital power and resistance, and by accelerating or increasing the waste and destruction of the hæmato-globulin; nutrition, and the healthy conditions of both the fluids and the tissues being more or less impaired. The most influential of these last causes are premature or excessive sexual indulgences in either sex, masturbation, excessive secretions and discharges, sedentary occupations in ill-ventilated and over-crowded apartments, impure air of any kind, confinement and insufficient exercise, defect of light and sunshine, &c.

241. IX. TREATMENT OF TUBERCULAR CONSUMPTION. — i. HISTORICAL SKETCH OF THE TREATMENT RECOMMENDED BY AUTHORS. — It was remarked by Dr. YOUNG, one of the greatest of the many names that adorn the literature and science, not only of our profession, but of our country, in his learned work on "*Consumptive Diseases*," that although we may not obtain, from the medical writings of the ancients any great variety of information immediately applicable to practical purposes, we may still feel a sufficient interest in the history of a science which deeply engages our attention, to induce us to inquire, how long the few truths which are fully established with regard to it, have been sufficiently demonstrated. "When, indeed, a fact is once well authenticated, no accumulation of authorities can be sufficient to invalidate its credibility; yet we cannot help placing a greater degree of confidence in opinions which we are, for other reasons, inclined to adopt, when we are informed that they are sanctioned by the observations of the most respectable authors of every age." It is necessary to premise that, until the commencement of the nineteenth century, the sub-acute and chronic forms of *bronchitis* were very generally described and treated as forms of *consumption*, and even as true *tubercular phthisis*; and that this want of precision in the diagnosis of these diseases led not only to a much greater diversity of opinion as to their treatment, but also to a marked difference in the reputed results of the means employed. The general misconception existing among writers respecting the precise nature and seats of bronchitis, and tubercular formations in the lungs, and their consequences, should be kept in recollection in reading the following sketch; for it will then become apparent that much of the benefit produced by many of the means recommended was actually not manifested in cases of tubercular consumption

but in those of sub-acute, or asthenic, or chronic bronchitis. (See Art. Bronchitis.)

242. Hippocrates frequently mentions tubercular consumption by the name phthisis, phthoe, and empyema, and states that the age most liable to it is from 18 to 35. He notices many of its most prominent phenomena; as the taste and appearances of the expectoration, the pain between the back and sterum, the frequency of hæmoptysis, the quick, wheezing respiration, the cough; the condition of the hair and nails; the sweats, diarrhœa, emaciation, pleural adhesions, &c. His treatment is not always consistent with itself. He advises caustics externally, emetics, purgatives in moderation, oxymel, milk diet, especially asses', goats', and mares' milk, warm from the animal; walking exercise; avoiding the extremes of heat and cold. In addition to these, several other, and often opposite means are advised in different parts of his writings, to which it is unnecessary to refer.

243. In the works of Aristotle are to be found the earliest notice of the opinion that phthisis is infectious. He states that this disease makes the breath corrupt and offensive, and those who approach the diseased person breathe air vitiated by him.—Plautus mentions resin and honey as being employed by the Romans for hæmoptysis; and Dioscorides, the physician of Cleopatra, and the greatest writer on the materia medica in ancient times, recommends sulphur—a substance which has been employed in various forms, even down to the present time.—Aretæus considers ulceration of the lungs as genuine consumption, called it phthoe, and gives a good description of the disease. Most of the chapter on the treatment is lost, but in what remains milk diet and sea-voyaging are strongly advised.

244. Celsus states that, in genuine consumption, a long sea voyage and change of climate are most advisable, if the strength will permit, and the climate of Alexandria is preferred by him. He remarks that the worst air for any disease is that in which it has originated. Amongst various other means he recommends milk-diet, with garlic, leeks, &c., with vinegar; farinaceous articles, occasionally some mild animal food; flour boiled with mutton suet, and some light and austere wines. He advises the cautery on various parts of the chest, and the ulcers not to be healed as long as the cough continues. He mentions several other remedies, as horehound with honey; the juice of plantain; garlic in wine, raw or soft; eggs with sulphur; hyssop; turpentine boiled with butter and honey; carriage exercise; sailing on a long sea voyage. For hæmoptysis he advises bleeding, cupping, wool wet with vinegar to be placed where pain is felt; a cool apartment, and rest.—The elder Pliny enumerates many substances as specifics for consumption, especially ammoniacum, a course of milk in the mountains, the juice of plantain, a linctus of betony with honey; goats' fat in gruel, or with honey and water, and a little rue, and various other means less rational.

245. The works of Galen furnish many prolix and digressive discussions on phthisis. The expectoration of cretaceous concretions was first noticed by him. He believes in the infectious nature of the disease. He prescribes vinegar much diluted with water for the hectic; bleeding, an emetic, purgatives, frictions, baths, exercise; a mild opiate at night, and removal to *Stabiæ* for the advantages of the air and milk of that place. He remarks that the air of that place is dry, the pastures healthy, the hills of moderate height, three miles from the Bay of Naples, sloping gently to the west, and near to Vesuvius, which makes the air still drier by its volcanic heat, and defends it from the north-westerly winds. At Stabiæ, he says, that the milk of cows is used; but he considers asses' and goats' milk preferable, the former being lightest, the latter of an intermediate nature. In order to allay the cough and improve the expectoration he prescribes frankincense, myrrh, saffron, squills, liquorice, mastich, tragacanth, &c., with syrup of grapes and honey. When the discharge is excessive, he employs opium and castor, or aloes, mastich, and saffron; or the juice of hyoscyamus with pepper; or a lozenge of *Scribonius Largus*, containing liquorice, myrrh, turpentine, and tragacanth; or sulphur, with cardamoms and cinnamon. Most of Galen's prescriptions were copied from those of the physicians who had preceded him. Various modes of preparing the *diacodium*, consisting chiefly of syrup of poppies and honey, are given; and for dry coughs, iris with honey is recommended, and for hæmoptysis, roses, gum, tragacanth, bole, linseed, and polygonum; and for the consumption consequent on it, iris with hyssop, bitter almonds, the juice of squills, with honey, southernwood, and various other substances.

246. Cælius Aurelianus gives a tolerably correct account of the disease by the name of phthisis or phthoe. The medicines he prescribes are honied water, fenugreek, iris, aristolochia, arum, and horehound; also fir-cones, with honey and liquorice; and diacodium with butter and honey. Sailing especially to a distant climate and reading aloud are also advised. He censures the use of emetics, and considers the cold bath dangerous. For hæmoptysis he directs astringent electuaries, and pomegranate with aloe, as advised by Themison. If the hæmorrhage continue in moderation, he prescribes bloodletting on the third day, as inflammation will then take place; but if the symptoms are urgent with dyspnœa, bleeding should be practised at an earlier period.—Oribasius gives merely an abstract of Galen's practice, and remarks that a milk diet is of more importance than all other remedies.—Aetius makes a similar remark respecting asses' milk. He also recommends venison fat dissolved in soup, and caustics to the chest.—Alexander Trallian gives ripe fruit for the hectic of phthisis, especially grapes. When concretions are expectorated he employs a cooling diet; and for the cough the juice of lettuce with liquorice; and the diacodium for relieving thirst and excessive perspiration. He also mentions the hermodactyls and their combinations. In the writings of Paulus Ægineta and Actuarius, there is nothing beyond what is contained in the works of Galen.

247. The *Arabian* writers exhibit no views of the nature and treatment of phthisis different from those which have been given by the Greeks. Rhazes, the most original of these, strongly recommends a milk diet, and fumigations from a mixture of orpiment, aristolochia, myrrh, styrax, and galbanum in equal parts, with a sufficient quantity of butter.—Avicenna prescribes cam-

phor lozenges; in the early stages bleeding; and generally a dry air, a milk diet, and sugar of roses. In all else he closely follows Galen.

248. The medical writers of the fifteenth, and of the first half of the sixteenth century, follow the doctrines and practice of the ancients, with the exception of Paracelsus. He recommends a powder for phthisis, containing crude antimony and crocus martis. He considers diet to be of the greatest consequence; and advises a bath to be tried containing a decoction of herbs with sulphur. —Fuchsius was the first to notice digitalis, but in a very imperfect way. Fernelius, whose reputation was high in the sixteenth century, praises asses' milk, and small bleedings for hæmoptysis; in all things he principally followed Hippocrates. Lommius notices the infectious influence of the expectoration and breath in phthisis, and the hereditary character of the malady. The work of Nicolas Piso is only a compilation from Galen and other ancient writers. Prosper Alpinus merely states, in his work on the Diseases of Egypt, that phthisis is one of the endemic maladies of the country. Forestus was amongst the first to give cases in detail; but he professes merely to follow the doctrines and practice of Galen. Among the means which appear to have been most beneficially used by him in consumptions are asses' and goats' milk; and sulphur with the white of egg. Schenk notices the use of turtle broth, and snails fattened on sugar and flour for hectic; but his materials are chiefly compiled from other writers. Most of the remedies he mentions have been already noticed; but we find that Avenzoar prescribed olive oil, Rubæus sulphuric acid, and J. G. Schenk the balsam of sulphur, in phthisis. The voluminous writings of Ballonius or Baillou, a physician in large practice in Paris at the end of the fifteenth century, contain nothing more deserving notice respecting phthisis than a remark as to the frequent occurrence of the disease in those who have nursed others affected with it.

249. Poterius, a physician to the French court, struck out novel modes of practice in this disease, but kept the preparation of most of his chemical medicines secret. These, as far as they are known, seem to have been oxydations of tin, of mercury, of silver, of antimony, of gold, &c., with various other substances. He employed sugar of lead as a refrigerant; and a preparation which, under the name of the antihectic of Poterius, long enjoyed a great reputation. Dr. Young states that this medicine appears to have consisted of two parts of tin and one of antimony, oxydated by means of nitre. He professes to have cured phthisis by giving five drachms of balsam of sulphur every morning with syrup, and the antihectic in the evening, sulphur lozenges and iris being held constantly in the mouth, with a diet of wine and animal food. The balsam of sulphur he recommends to be made with the oil of almonds, and given in milk; other oils make it too heating. Spigelius states that consumptions are more common in England than elsewhere, owing to the habit of confining the chests of females by tight dress; and that in Venice, where this habit does not exist, females are more healthy.

250. Sennertus, whose works were very generally confided in at the commencement of the seventeenth century, closely follows Galen. He considers the debility, diarrhœa, &c., to depend, in phthisis, upon an acrid or morbid secretion generated in the lungs. He prescribes many medicines, especially rhubarb, with infusion of roses and goats' whey; and he cautions against too copious evacuations of any kind. He advises an issue in one or both arms, if the debility and emaciation be not extreme. He remarks that sulphur was first recommended in phthisis by Dioscorides; and he makes favourable mention of honey, roses, horehound, hyssop, &c. He quotes other authors in favour of guaiacum and ginseng. Bontius, in his Medicine of the Indies, gives a case in which he supposes that fragments of the bronchi were expectorated, but which are mere false membrane formed on the bronchial surface. For true consumption he praises his opiate extract of saffron, which he says stops bleeding, quiets the cough, and has alone cured many desperate cases. He also prescribes conserve of roses with poppy seeds and sulphur, and decoction of ginseng or of sarsaparilla. Verily there are much worse modes of treatment employed in recent times than those adopted by Sennertus and Bontius. Tulpius furnishes nothing more deserving notice than the advantage obtained in a case of the disease by eating oysters daily.—Fabricius Hildanus describes several dissections of phthisical subjects, and notices the complication of pulmonary with mesenteric lesions, and the presence of calcareous concretions in the lungs. He relates several instances of successful recourse to setons.

251. Our countryman Bennet, as Van Swieten and Dr. Young very justly remark, has much surpassed his predecessors, and most of his successors also, as a writer on consumption, which he experienced in his own person. He pays marked attention to the breathing and the sputa, to the prognosis, and to the several contingent affections in the course of the disease. For hæmoptysis, leading to phthisis, he advises bleeding, warmth to the extremities, and bleeding from the feet in females, if the catamenia be scanty or suppressed. He recommends milk and milk diet, but prefers medicated whey, and reprobates the use of saccharine substances, as productive of an injurious fermentation. He considers the best expectorants to be those which contain resin and turpentine. Bennet also has recourse to frictions and fomentations, and to balsamic fumigations. These last should consist, in his opinion, of frankincense, turpentine, and styrax, with cinnamon, coltsfoot, and other articles, made into a powder or troche, and burnt on coals. He prescribes also mixtures of herbs, on which boiling water is poured, and the vapour to be enhaled by holding the head over the vessel containing them. Issues are much praised, and, according to my experience, with very great justice. He directs them in various situations, according to the symptoms, and he considers that they may be kept sweet by using peas of orris root, and when the discharge should be promoted equal parts of hermodactyls and wax. He recommends Welsh flannel to be worn next to the skin, and not to be too frequently changed. Animal food, neither very fat nor lean, is allowed, and a gentle emetic is given when the stomach is loaded, and a decoction of sarsaparilla and other woods with ginseng is recommended for drink. If we except the recent employment of cod liver oil in phthisis, in what, it may be asked, has the treatment of this disease been advanced

since the appearance of the work of Bennet, by the voluminous writings of specialists and stethoscopists in recent times?

252. The continental writers of the middle of the 17th century afford very little information as to the treatment of phthisis beyond what was previously known. Silvaticus confided chiefly in bleeding, issues, and sulphurated lozenges. Riverius notices the infection of persons who had nursed phthisical patients. Among the many substances already mentioned he particularises guiacum, Peruvian balsam, and the stomachic, and the diaphoretic gold, of Poterius. Bartholin furnishes nothing deserving notice further than that sitting apartments may be made, by suitable vapours or medicated effluvia, useful substitutes for a voyage to Egypt or other warm countries. Sylvius attributed phthisis to the existence of glandular tubercles, which, when in a state of suppuration, constitute the vomicæ. For the cure of the disease he administers opiates, demulcents, and emulsions, fumigations, decoctions of the woods, hermodactyls, &c. He praises balsam of sulphur, prepared slowly with oil of aniseed, and says that it facilitates expectoration and relieves the breathing. He considers the milk of sulphur to be much inferior to it. To promote the appetite he prescribes the elixir proprietatis, which is made of myrrh, saffron, aloes, sulphurous acid, and spirit of wine, digested together. The diet he allows comprises wheaten bread, broths, milk, yolks of eggs, biscuits, with a little generous wine.

253. Gideon Harvey gives a tolerably good description of phthisis, notices bleeding, and remarks that great caution is required in practising it. He prefers whey to milk, gives it liberally with conserve of roses, and mentions the imperatoria as being recommended to him for this disease. Willis remarks that the atmosphere of towns is not always unfavourable to consumptive patients, for he has observed many have better health and less cough in London than in the country. He prescribes sulphur in all forms, several balsams, and tar-water. After bleeding he advises narcotics, the muscus pyxidatus, warm bathing, frictions, blisters, &c. Diemerbroeck mentions the case of a person who was cured by taking goats' milk thrice daily for three months, without any other medicine. Bonetus furnishes some information as to the lesions formed in phthisical cases, but it is of a very loose and imperfect kind, chiefly furnished by former writers, many of them of little reputation.

254. Of the writings of Sydenham, which have been extravagantly praised, but which are now more justly estimated, Dr. Young justly observes, that "among the practical writers on consumption he cannot be considered, even by his warmest admirers, as holding a distinguished rank." His pathology of the disease hardly deserves notice. For a confirmed consumption, medicines are, he remarks, of little use; but bleeding, mild purgatives and pectoral remedies may be tried, with incrassants or attenuants, according to circumstances. For the fever he gives refrigerents, asses' milk, emulsions and opiates. For hæmoptysis he directs bleeding, cathartics and the avoidance of animal food. Horse-exercise is very strongly recommended by him; and he states, with the truth that many cannot fail to appreciate, that riding cures consumption as certainly as bark cures intermittents. Carriage-exercise is also praised by him. For simple cough he prescribes abstinence from wine and meat, for a few days; ten drops of anisated balsam of sulphur, taken occasionally on a lump of sugar; lozenges containing liquorice, alecampane, anise seed, angelica, iris and sulphur; and a linctus of oil of almonds, with syrup of capillaire and violets. If the cough be obstinate or attended by fever he orders bleeding and cathartics; and, if the patient becomes consumptive, ten drops of Peruvian balsam, three times a day, a decoction of bitter plants, riding being the chief remedy. G. Harvey, after ridiculing the treatment of consumption proposed by his predecessors, concludes that there is a single cheap remedy which does wonders; but this remedy he conceals. The only remark made by him deserving notice is, that hectic is generated by the pus which enters the blood; for the disease is partly an affection of the fluids, and not, as has sometimes been supposed, of the solids alone.

255. The *Phthisiologia* of Morton was for more than a century the basis of practice in consumption, although in all most important matters it was anticipated by the writings of Bennet. There remains, therefore, but a few topics deserving notice. Chalybeate waters are considered by him as preferable to all other means for the prevention of the disease, especially in scrofulous constitutions; he directs them to be taken freely, either cold or warm. He considers catarrh to be the most frequent cause of phthisis; and infection sometimes to occur, for he believes that it may be communicated to a bed-fellow. When proceeding from this latter cause, he considers it to be most fatal. He recommends bleeding in the early stage, but views it as fatal in the advanced stages, and opiates for the cough with purgatives, as the aloetic tincture. After bleeding emetics are viewed by him as of great benefit, in the first stage, but they ought to be followed by opiates. He frequently prescribes his stomachic pills, consisting of aloes, myrrh, mastich, saffran, cloves, wormwood, nutmeg, calamus, mace, rhubarb, musk, cardamoms, &c. In scrofulous and scorbutic consumption he recommends pills of gum ammoniac, with benzoin, balsam of Peru, and sulphur. But in all forms of phthisis, especially in the more advanced stages, he considers cinchona the great and general febrifuge. Several forms and complications of consumption are particularised by him as requiring different or additional means of cure. He says that, in asthmatic phthisis, opium is injurious, by increasing the dyspnœa; but that ammonia and the citrate of potass are most useful remedies. In the melancholic and hysterical phthisis, emetics, he avers, act like magic, and opium is particularly requisite. For phthisis complicated with hæmoptysis, after venesection and other remedies, he gives the bark in doses of a drachm every four hours. He remarks that calculi may form in the lung, may lie there a long time inactive, or they act as foreign bodies. Consumption consequent on syphilis he considers to be of an asthmatic nature. Chlorosis often passes into phthisis, he justly observes, by imperceptible degrees, if not treated by chalybeates and purgatives. When he suspects internal ulceration, he gives from 20 to 30 grains of calomel every third or fourth morning, and the diaphoretic antimony

at night. Brunner states that he "entertained strong doubts of the propriety of Morton's practice of giving cinchona in hæmoptysis, till he found by experience that it succeeded, where every thing else had failed." (Young, p. 203.)

256. Ettmuller recommends emetics early in phthisis, and a diet of milk and raw new eggs. Baglivi furnishes us with nothing novel, excepting that he supposes ipecacuan to be the best remedy for this disease, and for all hæmorrhages and discharges. Wepfer furnishes some of the earliest information as to tubercles. In his observations on diseases of the head, he gives an account of an *endemic* consumption at Waldschut on the Rhine, where there is a cavern in which mill-stones are dug and wrought. The air is there always hot—even in winter, and a very fine dust floats in it. All the workmen employed in it become consumptive, if they remain a year, or even a shorter time.

257. Stahl's opinions as to the treatment of phthisis are not worthy of his reputation. His remarks are chiefly directed to the non-efficacy of most of the means which had been advised up to his time, and many of his observations are just. He reprobates the use of balsams, opiates, expectorants, cinchona, myrrh, balsam of sulphur, &c., and confides chiefly in bleeding, and nitre in moderate doses; and asses' milk, he says, is fit only for asses. The too general or inappropriate use of these and other medicines—the universal employment of a medicine because it has been advised, or found useful in one or even a few cases, is mere empiricism. It is the appropriate exhibition of a medicine to inferred pathological conditions, which constitutes rational practice. He remarks that females are more frequently consumptive than males; but they have a greater chance of escaping its fatal termination. He considers exercise on horseback, or in a carriage, to be the most beneficial remedy for phthisis. Fuller agrees with Stahl as to riding on horseback being most salutary in this disease, when "without fever or ulcer;" but he adds that "the patient must be a Tartar, and live on his horse."

258. F. Hoffmann, the rival of Stahl in reputation, fully discusses the treatment of hectic fever and phthisis. He remarks that hectic attended by indigestion may often be relieved by an emetic of ipecacuan, followed by a dose of aloes. If amenorrhœa be a concomitant, bleeding in the feet and deobstruents, are prescribed by him. If mesenteric disease complicate phthisis, as often observed in children, warm bathing, nitre, sulphate of potass, and sal-ammoniac are recommended. In all hectics he considers milk a principal remedy, especially woman's milk, asses' milk, goats' milk, or cows' milk, with manna or conserve of roses, or with seltzer-water. He also ventures to give the tincture or infusion of roses, cascarilla, cinchona, and nitre. He gives the muriate of potass when the appetite is weak. Bleeding, he says, should be practised with much caution. He adverts to a patient who was kept alive thirty years by losing some blood twice a-year, and drinking a decoction of ginseng and sassafras. The treatment which he more especially advises for phthisis is somewhat similar to the foregoing. He thinks justly that, where a predisposition to the disease exists, it may be called into action by attendance on a consumptive patient. When a milk diet occasions acidity, he substitutes whey; with which, or with milk, mineral waters, or lime-water, may also be mixed. He considers the best laxatives in phthisis to be manna, magnesia, rhubarb, or senna taken in milk; and milk or whey with parsley-seeds, or celery-seeds, to be the best diuretics. He is not favourable to the use of gum-resins or balsams, if they occasion, or if given during, febrile action. Myrrh, saffron, copaiba, opium, honey, wax, spermaceti, and oil are viewed more favourably. In the young and plethoric, small and frequent bleedings, air, exercise, and warm baths are, he believes, the best prophylactics. He considers half the cases of consumption to originate in hæmoptysis, and he advises that the bleeding should not be stopped too soon by astringents. In advanced cases, bleeding to the amount of an ounce only, often relieves the breathing. He says that emetics and strong cathartics are injurious. He makes favourable mention of issues, and of a stomachic elixir, composed of myrrh, saffron, nutmegs, and buck-bean, which is to be taken at meals, consisting chiefly of milk diet, broth, and ptisan. For the colliquative perspiration he gives nitre and opium in small doses. He often prescribes also sulphur and diaphoretic antimony; and the combination of milk with mineral waters is much praised by him. It will be seen that the treatment adopted by this great physician is, in most respects, of great excellence, and when employed appropriately to the circumstances, form, and stage of the malady, by no means inferior to any adopted at the present day.

259. Musgrave was the first to point out the connection of phthisis in some instances with irregular gout. The treatment he advises is not materially different from that recommended by Bennet, Hoffmann, and others. Boerhaave furnishes no information as to the treatment of phthisis in any way worthy of his great reputation; his practical judgment appears to have been overlaid by his hypothetical doctrines. The respectable synopsis of Allen furnishes one very good suggestion, namely, the propriety of the liberal use of buttermilk in consumption. He also believes in the contagious nature of the disease in certain circumstances favourable to its operation. Wherlhof comes to the defence of cinchona and Morton against the attacks of Stahl. Dover in his ancient Physician's Legacy, appears in his heroic character of buccaneer in the treatment of phthisis. He advises a frequent repetition of bleeding in small quantities, horse-exercise, crude quicksilver in large quantities, a substance much in fashion at the commencement of the eighteenth century; and aniseed and crocus martis made into pills with the balsam of Locatelli, in the morning, and elixir of vitriol in the afternoon. He gives also his powder, which originally contained nitre instead of the sulphate of potash of the modern powder. He advises the antiphlogistic regimen.

260. P. Desault deserves notice for his having been the first to contend that tubercles in the lungs constitute the essence of consumption; that they are generally antecedent to hæmoptysis; and that ulceration of the lungs is merely an effect and not a cause. He adds nothing to what has already been stated as to

the treatment. Juncker, the methodiser of the doctrines of Stahl, furnishes but little information respecting phthisis, and almost none deserving notice, excepting his approval of riding, and his disapproval of warm balsams and aloes. Wainewright considers Cheyne correct in concluding, that the quantity of blood is much diminished in hectic, and thinks that pectorals and balsamics are injurious, unless they serve as stomachics and diuretics. He prescribes gentle emetics, mild stomachics, riding, pure air, frequent blisters, and a light, digestible diet. Dr. Thomson is in favour of small doses of antimonial wine in consumptions.

261. Dr. Huxham's reputation induces a desire to know his practice in phthisis. He remarks, that catarrh occasions this disease only when tubercles had previously been formed in the lungs, and that the malady may be fatal before an ulcer is formed. Instead of sweet, oily, emollient, and other substances, which often disagree with the stomach and occasion acidity and diarrhœa, he employs gentle diaphoretics, blisters between the shoulders, mild cathartics with anodynes interposed, the decoction of cinchona, with guiacum and styrax, and inhalations of drying fumigations. He advises those of a consumptive tendency to remove into the country in the spring, and to lose a little blood as a precaution. Russel's work on glandular decline is of some importance as recommending a remedy within the reach of most persons, and one of great efficacy when judiciously employed, namely, sea-water, especially when taken internally, warm or cold, according to the circumstances of the case. He employs it also externally, at different temperatures.

262. Dr. Mead insists on the intimate connection of phthisis with scrofula, and considers that the use of bark in the disease is indicated by the periodicity of the attendant fever; but he believes it to be injurious when the lungs have become ulcerated. Goats' milk and whey are recommended; and when milk disagrees with the bowels, it may be boiled with roses, pomegranates, and cinnamon, with the addition of water. The fumigations advised by Bennet, change of climate, a voyage to Naples or Lisbon, are severally noticed with approbation. Dr. Bryan Robinson praises emetics, especially those with ipecacuan, in hæmoptysis, and adduces evidence of their effects. Dr. Horsburgh gives some cases showing the benefits produced by the aluminous chalybeate spring, the Hartfell Spa near Moffat, at an advanced stage of consumption.

263. Dr. Gilchrist adduces numerous cases showing the great advantage accruing from sea voyages. He considers hæmoptysis a consequence of tubercles previously existing, and remarks that there are still tubercles to be resolved, even after ulceration has taken place, and hence the difficulty to give appropriate remedies for every stage in which tubercles may be found. But sailing and sea air appear the best calculated to fulfil all the indications. On a rocky coast, where the inhabitants live much on shell-fish, he observed consumption decidedly more rare than in the country inland. He considers that the practice in this disease should consist in a proper administration of bleeding, issues, mercurials, balsams, diet, sea voyaging, and sea air.—The practice of Dr. Marryat has been very generally adopted, at least in many of its parts, until modern times. He strongly objects to bleeding in consumption, and recommends a nourishing diet, especially of pork broth, and exercise on horse-back, but above all the "dry vomit," consisting of a grain of tartar emetic, with three of ipecacuanha, to be taken fasting twice or thrice a week, without drinking after it. If there be diarrhœa he directs a grain of sulphate of copper with four of ipecacuanha. If ulceration exist, he gives twenty drops of copaiba in sugar night and morning. For hæmoptysis he gives his emetics in increased doses. Bark, nitre, sulphur, chermes mineral, and alum are also severally employed according to circumstances. For scrofula he prescribes corrosive sublimate, with the addition of a few drops of the hydrochloric acid, &c.

264. There are few topics connected with the treatment of phthisis more important than that respecting the employment of opium, and to this Tralles has devoted much attention, in a prolix and discursive work, in which the general treatment of the disease also is fully discussed. He considers opium to be useful in the first stage, but to be injurious afterwards. He thinks that it is not even a palliative. He, however, gives it in enemata with decoction of bark and milk, for the palliation of the colliquative diarrhœa, and admits that it is useful in small doses when the cough is violent, for which also he gives the syrup of poppies. He recommends Plummer's pill, ammoniacum, soap, squills, and honey, milk diet, milk with lime-water, emulsions, and farinaceous substances. The works of Morgagni furnish no precise information as to either the morbid anatomy or the treatment of pulmonary consumption, beyond what was previously known. Of the other contemporary writers on medicine there is none who gives any information respecting the treatment of consumption deserving notice, until we arrive at the works of Sir John Pringle, Donald Monro, and others.

265. The observations of Sir John Pringle deserve the high estimation in which they have always been held. In recent coughs he gives, after bleeding, mucilages, oils, and ammonia, in the form of an emulsion; and at night laudanum with oxymel of squills, or gum ammoniac. When the symptoms assume the form of hectic, he repeats the bleeding, recommends low diet, and the employment of setons or issues, which he justly considers still more beneficial than bleeding. If thirst or heat be great, acidulated drink, or buttermilk, without animal food, are advised. To check the sweats he uses sulphuric acid, or lime-water, conserve of roses, air, exercise, a milk and vegetable diet, and where there are debility and lowness of spirits, the bark is recommended.—Donald Monro appears to have adopted the practice of Pringle in phthisis. He has recourse to bleeding when there is pain, and to cinchona when neither pain nor difficulty of breathing is experienced. Setons and issues, he says, are always of use. A gentle emetic is advised for difficulty of breathing. For diarrhœa rhubarb and afterwards opiates are given.

266. Lieutaud, in his Synopsis of Medical Practice, considers bleeding injurious, and advises chiefly a milk diet, with pectoral decoctions, balsams in small doses, sulphur, tar-

water, or Morton's balsamic pills, the fumes of balsamic herbs, the waters of Bonnes or seltzer, or lime-water mixed with milk, riding, issues between the shoulders. For the consumption produced by hard study, he prescribes camphor with Hoffmann's anodyne, baths, frictions, change of air, horse-exercise, and generous wine. Linnæus suggests the use of the lichen pulmonarius in phthisis. The Lichen Islandicus was known to earlier writers, according to Dr. Young, although it is not mentioned by Linnæus. Mr. Read lauds a residence in a cowhouse in cases of consumption, and says that it is preferable to any fumigations. The recommendation of a medicine called the decoction of a thousand flowers, which was much used from two to three centuries ago for the different forms of consumption, is more rational than this singular residence. This decoction, or infusion, as sometimes prepared, was made from the recent dung of cows, whilst feeding in open pastures, warm or cold water being mixed with it, and allowed to stand a considerable time, and the clear fluid being poured off for internal use. The bile existing in the dung was thus partially extracted, and employed as a stomachic.

267. The works of Heberden, Sauvages, and Fothergill, furnish no additions to the method or means of treating phthisis already known. Stoerck is extravagant in his praises of hemlock in this disease. Van Swieten, in his commentaries on the aphorisms of Boerhaave, observes that persons exerting their voice in their professions are more liable to hæmoptysis than others; and that Molière died of an attack of this disease immediately after performing his "Malade Imaginaire" for the fourth time. He believes in the communication of phthisis by infection, and considers that an hereditary disposition to the disease does not necessarily imply its actual existence. He approves of camphor as prescribed by Avicenna (§§ 247.), and of the treatment adopted by Pringle. He praises the use of milk, small but frequent bleeding, horse-exercise, the cautious employment of cinchona, and of opiates. For relief of the diarrhœa, he directs an enema of a drachm of turpentine, rubbed down with yolk of egg, adding half an ounce of theriac, and four ounces of new milk.—The treatment recommended by Macbride is, in most respects, the same as that already so frequently noticed, namely, gum ammoniac, soap, and ammoniacal iron, early in the disease; gentle emetics to promote expectoration and relieve dyspnœa; bark, in some cases, goat's whey, asses' milk, buttermilk, seltzer, Bristol, or Malvern waters; riding, and especially sea-voyaging, setons, or issues, &c. For hæmoptysis, he directs bleeding, opiates, and demulcents. Winteringham disapproves of fumigations, as prescribed by Bennet and Mead, but thinks that the steam of hot water containing vinegar of squills may be inhaled with advantage.

268. Dr. James Sims, the founder of the Medical Society of London, is favourable to emetics, to sulphur, and to cinchona, suitably employed. Tar-water is also useful, but he considers tar-pills to be preferable. The following remarks are correct: — Females not uncommonly have a respite from consumption when they marry, but sink under the disease after having had two or three children. The catamenia may remain natural till the last stage, but this, I may add, occurs only occasionally, and chiefly in the more chronic and protracted cases. Schoenheyder employs the decoction of Iceland moss, especially in phthisis consequent on measles, or after the removal of inflammatory symptoms. Tode very judiciously gives the bichloride of mercury in the infusion of cinchona, with Iceland moss, and a milk diet, in syphilitic consumption.—Dr. Moses Griffith is deserving of notice, chiefly for his recommendation of chalybeates in consumptions, and more particularly for his Mixtura Ferri Composita. This mixture is, however, varied by him according to the circumstances of the case; adding nitre in young subjects and recent cases, myrrh at a more advanced stage, and when there is more debility. He further advises a diet of asses' milk, or skimmed milk, puddings, rice, potatoes, and a little light animal food, once a day, and above all, snail-broth, or snails boiled in milk. Linné reports favourably of the Hypericum perforatum, in hæmorrhagic and ulcerous phthisis, a handful of the tops of the plant being made into a decoction with Spanish wine, boiled down to one-third, and an eighth taken morning and evening.

269. The treatment adopted by Cullen for phthisis was generally followed in this country until early in the present century. When expectoration of purulent matter, with hectic fever, is present, he believes that ulceration exists. He views catarrh as rarely a cause of phthisis in persons not predisposed to this disease, but it ought not to be neglected. Spasmodic asthma not unfrequently terminates in phthisis. In two cases of the expectoration of chalky concretions, the patients recovered by the aid of milk diet, &c. Consumption from hæmoptysis is less universally fatal than other forms. "Hæmoptysis is not always followed by ulceration, nor is ulceration always attended with hectic. Pregnancy retards the symptoms, but they generally recur and become fatal soon after childbirth." In the hæmorrhagic form of the disease he thinks the acetate of lead dangerous, and chalybeates and cinchona improper, as tending to increase the phlogistic diathesis, and as having been found injurious in his practice. He prefers evacuations of all kinds, a low regimen, and blisters to the breast or back, followed by issues. Sea-water, and other mineral waters are wholly useless, and mercury is prejudicial. Milk is a chief remedy; and violent exercise, and the extremes of cold and heat, are to be avoided. He thinks that sea air is desirable only for its moderate temperature; that the balsams, myrrh, &c., have sometimes done harm; that bark increases the phlogistic diathesis, and even when it relieves for a time, the symptoms speedily return; that acids are useful, especially vegetable acids; that opiates are necessary for allaying the cough, but they often increase the sweats; that demulcents frequently disagree with the stomach; that the diarrhœa requires astringents and mucilages, and that all purgatives are dangerous, but ripe fruits are often both agreeable and beneficial. M. Brillonet records cases illustrating the connection of tubercular phthisis with scrofula, and the successful treatment of the former by small doses of corrosive sublimate, and by a diet of soup, eggs, and vegetables.

270. Stoll offers some judicious observations, although others are more open to objections. For tubercular hæmoptysis he advises small and repeated bleedings; gentle emetics; acid and nitrous drinks, and afterwards lichen, polygala senega, or cinchona. For hectic diarrhœa he gives the powder of the root of arnica. He disapproves of balsams, bark and astringents, where there is any inflammatory complication.—Bergius strongly recommends the Iceland moss in phthisis. When its tonic qualities are not required he directs the bitterness to be extracted by previous maceration.—Dr. Mudge employs the inhalation of medicated vapours for consumption. He believes hæmoptysis to result from the obstruction caused by tubercles; and for this state of the disease he advises nitre in solution, a moderate bleeding, and emetics; for cough the inhalation of emollient vapours, the ammoniacum with laudanum, or half a drachm of the anisated balsam of sulphur, a very large scapulary issue, if these fail, and a milk diet and vegetables. He reprobates the use of small issues, and advises them to be large and efficient—a recommendation agreeable to my experience.

271. Dr. Simmons notices the form of consumption produced by dry-grinding, or by breathing the minute particles of sandstone and iron. He considers the practice of bleeding to have been carried too far by Dover. He prescribes nitre and camphor, myrrh with spermaceti; and oranges and ripe fruit in preference to sulphuric acid. Setons and issues, he says, are useful, opiates mischievous, and ripe fruit and antiseptics are the best remedies for diarrhœa. A little animal food, plainly dressed, may be allowed if much desired. Change of air is advised; but, he justly adds that migration to a warm climate, late in the disease, merely hastens death. Emetics of sulphate of copper, twice or thrice a week, in the early stage, preceded and followed by a draught of water, are also given with the vain hope of dispersing the tubercles.—The observations of Home, Duncan, and Reid furnish little or no information. The last named physician advised chiefly the exhibition of ipecacuan emetics, morning and evening, and considered sea-voyaging beneficial, mainly by producing nausea and vomiting. Verily his treatment seems to have been as bad as the disease. Borsieri again thinks emetics injurious, and balsamic remedies hazardous; but he approves of bark in incipient cases, of camphor, and of balsam of tolu and turpentine in advanced stages. Pouteau advises, when pain is experienced, bleeding, and cupping, and blisters.

272. Dr. Stark's posthumous observations contain the earliest correct account of the anatomy of tubercles. He is favourable to bleeding in the early stages, to oleaginous and demulcent medicines, and to vinegar of squills, &c., when cough and dyspnœa are urgent. Raulin's views as to the treatment of phthisis are in some respects heterodox. He is more correct in recommending ipecacuanha in the catarrhal complications of the disease. He considers gums to be preferable to emulsions; and the preparations of cascarilla to be appropriate for the sweats and for diarrhœa. Syrup of tolu with ptisans; and myrrh, camphor, and a little opium every night, are very generally prescribed. He praises opium in large doses for hæmoptysis; and the mineral waters of Cauterets and Bonnes for convalescents. Dr. Withering, in 1785, in his account of the foxglove, notices the recommendation of this medicine by Mr. Saunders in consumption, and states that he found it of advantage in several cases when it was given in a decided manner. Dr. Darwin, however, is doubtful of its good effects; and Sir G. Baker is of opinion that its influence in phthisis is owing to the sickness it occasions.

273. Sir G. Blane considers the best climate for the consumptive to be between 30° and 40° north latitude. Vogel prescribes the vegetable acids with gum arabic; and, for phthisis after fevers, the taraxacum, bitter extracts and horehound, or the cold infusion of cinchona with rhubarb, if inflammatory symptoms be absent. The cold infusion of bark he gives most frequently with acids or nitre, or made with whey, and preferably during the remissions of the hectic. He agrees with Sims as to the use of oysters as an article of diet. Quarin considers emetics unsafe in phthisis; he gives bark with sulphuric acid for the sweats; spa water with milk in preference to seltzer water; and the senega when the expectoration is difficult. Dr. Moseley believes that England furnishes change sufficient for an invalid; but that a voyage to Madeira early in the disease may be of advantage. For hæmorrhagic phthisis, and pulmonary oppression he prescribes a vitriolic solution with the sulphates of zinc and alumina as an emetic, instead of bleeding, followed by a sea voyage.

274. Dr. May states that, in a well-marked case of phthisis in a young person of a scrofulous constitution, the patient took laudanum night and morning, an ipecacuanha emetic when the stomach was loaded, and cinchona; and that the diet consisted of soup, meat, wine, porter, brandy and water, eggs, oysters, &c. with proper condiments. Swinging was employed twice daily, and horse-exercise completed the cure. A similar case was published by Dr. Kentish. I recollect meeting Dr. May in 1820. He argued strongly in favour of his tonic and nourishing method of treating phthisis, which then appeared heterodox, but which is now more or less adopted. Dr. Grieve notices his employment of koumiss, a fermented liquor made from mare's milk, in the early stage of phthisis. The fermented whey of cow's milk is used as a popular beverage in this disease in Norway and the Shetland Isles. Dr. Crichton gives a favourable report of the Iceland moss in cases of phthisis uncomplicated with inflammation. Bang of Copenhagen recommends the oil of asphaltum, in doses of eight drops morning and evening in rye broth. The pneumatic treatment, first tried by Fourcroy, and more fully discussed and employed by Beddoes, furnishes no satisfactory results. Dr. Senter, U. S. prescribes emetics of ipecacuan and sulphates of copper, every second or third morning, without eating or drinking, and as much of Griffiths's chalybeate mixture (§§ 268.) as the stomach will bear in the intermediate time. For children especially, the sulphate of zinc is a preferable emetic. A milk diet is also directed.

275. The second volume of the "Medical Inquiries" of Dr. Rush of Philadelphia, contain some of the most important observations on consumption which appeared towards the close of

the last century. He was himself subject to consumptive symptoms during a considerable portion of his life,—a circumstance which imparts additional weight to his advice. He recommends, upon the first indication of the disease, or as soon as heat in the hands, weakness of the eyes on wakening, dryness of the feet, inactivity, and other slight febrile symptoms appear, the patient to have recourse to a more active life, with bathing, bark, and steel. When the pulse is hard, with pain or bloody expectoration, he directs frequent bleedings, and where bleeding cannot be employed, emetics and milk diet. In the last, or typhus stage, as he terms it, he considers that a temporary benefit is derived from balsams, horehound, vegetable tonics, bitters, cinchona, &c., the diet being now stimulating and nutritious. He believes damp situations injurious in all states of the disease, and a high, dry, and temperate residence in the country most beneficial. He advises also flannel always to be worn next to the skin, the dilute vapour of tar, or the smoke of resin to be inhaled, opiates to be given in small doses during the day, and more largely at night, and repeated blisters and small issues to be employed. He admits of a moderate exercise of the lungs in speaking, reading and singing; and a gradually increased exercise of the body, especially of the limbs.

276. Dr. Gregory of Edinburgh in his lectures considers mercury injurious; cinchona of little use, and myrrh of less. The mineral acids he views as palliatives only, and as inferior to the citric acid. Emetics are sometimes useful, even without operating powerfully; sulphur is liable to be too laxative, but beneficial nevertheless; and purgatives hazardous as either inducing or aggravating the diarrhœa.—Dr. Ferriar finds digitalis with change of air of service in the mucous consumption (chronic bronchitis), and in checking incipient phthisis, when the patient is too weak to bear evacuations. The pneumatic means, so much and so sillily vaunted at that time, and like other means puffed, with their authors, into undeserved notice much more recently, he justly considers quite undeserving adoption.—Dr. Garnet introduced several chemical medicines into practice, about the end of the last century. He prescribes the sulphuret of potass, and powdered charcoal, in the florid states of consumption, and gives a drachm of each of these, four or five times a day, in warm water, with the effect of promoting expectoration and improving the other symptoms. I question, however, the ultimate good arising from medicines which "promote expectoration," as I have too frequently seen them promote other more unfavourable symptoms.

277. In the writings of Darwin, in which there is a mingling of hypothesis, fancy and poetical imaginings, with ill-assorted experience, I find nothing on the treatment of phthisis deserving notice, or at least nothing worth attention which had not been previously advised by many of his predecessors.—J. Frank professes himself an advocate for the tonic and nutritious treatment in phthisis proposed by Salvadori, May, and others, though with much more moderation in the degree; palliating the urgent symptoms by opium, and endeavouring to relieve the debility by cinchona, lichen, milk, wine, exercise and nutritious food—a treatment, however, by no means admitting of general adoption.—Dr. Barton mentions the Arum triphyllum boiled in milk as a remedy in phthisis, states that has known only of one case of the disease cured by digitalis; and that he finds more benefit from emetics of sulphate of zinc, than from other means.

278. Dr. Fowler and Dr. Ferriar relate cases of consumption cured by digitalis given as decoction or infusion; but it is not improbable that more benefit was imputed to the medicine than it really deserved, as most of the cases were characterised chiefly by hæmoptysis, and as those are often attended by prolonged periods of amendment. That it is, however, followed by some degree of benefit, especially early in the hæmoptysical form of the malady, appears from the testimony of Beddoes, Mossman, Maclean, Sherwen, and others, although this position is denied by Dr. Bree. Dr. Magennis' success with digitalis may be attributed chiefly to the very large doses, and to the early period of the disease in which he prescribed it.—Busch in his researches employs chiefly aconite, hemlock, henbane, and dulcamara, combined with either ipecacuan, chermes mineral or honey of squills. He prefers the leaves of aconite to the extract, and gives two grains every two hours, increasing the dose to a drachm daily. Dr. Beddoes insists upon the propriety of confining the phthisical patient to a temperature varying only from 60° to 65°, and believes that the muriate of lime is sometimes of service.

279. Dr. Heberden considers asses' milk to be of use in allaying the fever; decoction of bark and sulphuric acid in relieving the sweats; opium in quieting the cough and favouring sleep; bleeding to the amount of five ounces only, when pain is urgent; and the application of a blister when the pain is obtuse. He advises a vegetable diet chiefly, and the purest water for drink.—Dr. Thomas recommends an emetic every second or third day, especially in the early stage, Griffith's iron and myrrh mixture, and digitalis. Dr. Trotter is favourable to cinchona and sulphur; and to digitalis with opium. Dr. Wilson considers sulphuric acid to be most efficacious in checking the sweats; and a demulcent mixture with spermaceti and a little laudanum most useful for the cough. He allows animal food in moderation; and the vapour of warm water, in which onions have been boiled, to be inhaled in order to facilitate expectoration. Dr. Bourne furnishes experiments on the use of the uva ursi in consumption, from which he infers it to be of service early in the disease, in doses of ten or twelve grains, twice or thrice daily, sometimes taken with a small dose of opium. The end of the last century, and the commencement of the present, abound with writings on the treatment of phthisis, many of them most inconclusive, some of them trifling or puerile, and nearly all of them deficient in precision of description, and in logical inference. Most of these are filled with discussions and cases proving and disproving the efficacy of digitalis, and commenting upon the operation of this medicine.

280. Dr. Badham, in 1808, was the first to distinguish between asthenic and chronic bronchitis and tubercular phthisis, the former having been generally viewed as varieties of pulmonary con-

sumption, and thus confounded with the tubercular disease. A large proportion of the recoveries of cases which had been considered tubercular, was evidently cases of bronchitis. Several writers at this period added nothing to our knowledge, or placed before us the "crambe bis coctum," or rather decies coctum, of their predecessors. Russell expresses a favourable opinion of bark, calumba, chamomile, sulphuric acid, and iron, with hemlock. But these require discrimination as to the cases in which they may be individually prescribed. He considers the virtues of hemlock to be much overrated. Both he and Thomson state the muriate of lime to be without any efficacy. In the more purely scrofulous phthisis, he considers issues to be decidedly beneficial, and sulphuric acid and salines as preferable to cinchona in the early stage. Barton and others in America employ the super-acetate of lead with ipecacuan and opium in the hæmoptysic form of phthisis.

281. The remarks of Dr. Parr are upon the whole judicious. He advises the pain in phthisis to be pursued by blisters as it changes its place; emetics to be given chiefly in hæmoptysis, and without informing the patient, ipecacuanha being preferred; and mild diaphoretics in an early period. He considers balsams of use only when expectoration is checked by debility; myrrh occasionally of service as a slight tonic and sedative; hemlock to be preferable to opium in palliating the cough without occasioning sweats; cicuta and the seeds of hyoscyamus to be often useful; and digitalis to do more harm than good. Assafœtida is recommended for flatulency and as an expectorant. In the last stage, emetics and other means are quite inefficacious, or palliatives merely. — The work of Portal, although interesting at the time when it appeared, contains very little of importance in respect of treatment. He considers the mildest food the best, and particularly new-laid eggs; and issues, setons, and moxas, of service.—Dr. Buxton furnishes additional evidence to that adduced by Beddoes in favour of a regulated temperature in phthisis, of from 60° to 65°. Dr. Shearman notices the connection of consumption with amenorrhœa, and observes that Griffith's chalybeate mixture has been more successful in females than in males, owing to this connection. There is much truth in this: early in the disease this mixture is advantageously conjoined with the compound decoction of aloes and conium, and even in more advanced stages, if it do not increase the severity of the cough.

282. M. Bayle very justly referred many of the cases of imputed recovery from phthisis, to the circumstance of chronic bronchitis, or chronic pulmonary catarrh having been mistaken for phthisis; and he described, with greater precision than heretofore, the structure of the tubercular deposits, and the pulmonary and the associated lesions. The granulated form of this writer is merely the earlier stages of the disease, excavations not having taken place. In this state he advises, according to the features of individual cases, composing and emollient medicines, occasionally bleeding, blisters, and issues; aconite, hemlock, henbane, nightshade, and opium, and, where the expectoration is very copious, balsamic and resinous medicines. In the state of ulceration, he employs medicated vapours, and external drains and revulsants of various kinds. In cases complicated with chronic bronchitis or catarrh, the lichen, with diaphoretics and balsams, is prescribed; or with bark, when there are well-marked rigors. Streaks of blood in the expectoration require lemonade or orangeade, and bleeding if the pulse be hard, blisters, if soft. As prophylactics, he recommends travelling, voyaging, change of air and climate, nutritious diet, anti-scorbutics, tonics, alkalies, muriate of ammonia, &c.; for incipient cases, repeated emetics, bitter and stomachic purgatives, a sea voyage, exercise, the sulphuretted waters of Bonnes, Cauterets, Bagnères, or Mont d'Or; and later in the disease, mild tonics, as the lichen, syrup of cinchona, &c.

283. Dr. Wells contends that phthisis is much less prevalent in marshy countries and districts where agues are endemic, and advises that consumptive patients should be removed, at least for some time, to these places. He quotes several authorities and statistics, by both which the subject is placed in exaggerated points of view. It is not yet satisfactorily proved that malarial situations are beneficial in either the early or the advanced stages of phthisis; at least the matter should be further investigated, as well as the assertion that places wherein ague is endemic, are free, or nearly free, from phthisis; inasmuch as the position is controverted by several more recent writers, although contended for by Marshall, Weekes, Harrison, and others towards the close of the last century and at the commencement of the present.

284. Dr. Roberts has endeavoured to discover a more effectual remedy for consumption amongst the active mineral salts and other substances, than those hitherto employed. He has, however, only to record the failures of his experiments, with the nitrate of silver, superacetate of lead and opium, sulphate of zinc, oxyde of zinc, alone or with myrrh; white oxyde of manganese (10 grains); arsenite of potass; black oxyde of cobalt (one to four grains); ammoniated copper, muriate of baryta, nitric acid, phosphoric acid, aconite, henbane, stramonium, belladonna, and toxicodendron.

285. Dr. A. Duncan gives the results of his long experience in the treatment of phthisis. He considers hæmoptysis as often a salutary occurrence early in the disease; bleeding with low living to have hastened death in many cases; emetics to be of use in promoting expectoration, but to be useless as respects the cure of the disease; and blisters to be of service in most forms of the malady. He believes that vegetable acids are more beneficial than the mineral or acetous; that digitalis is of little use, and sea voyages are counteracted by the inconveniences and risks attending them; that bark, myrrh, lichen, or these with hemlock, are sometimes of service in scrofulous cases, but that the pneumatic practice is altogether unsuccessful; that the diarrhœa may be moderated by mucilaginous fluids and broths, melted jellies, rice, catechu, opium, &c.; that the inspissated juice of the common lettuce is one of the best substitutes for opium, and that the patient should take asses' milk, wear flannel next to the skin, and have walking and riding exercise.—Dr. Southey has remarked upon the frequency and infrequency of phthisis in different countries. He is in favour of the use of

issues, of digitalis for hæmoptysis, of a regulated temperature, by means of a stove from 60 to 65°, of riding, sailing, and swinging, and of change of air, at an early stage, to Valencia, Hières, &c.

286. Dr. Thomas Young, in his able and learned work on Consumptive diseases, has given an interesting account of the treatment of these diseases, and a full digest of the means employed for this purpose in this country during the first quarter of the present century; and until the diagnostic method of Laennec and the pathological and numerical disquisitions of French writers allured the minds of practitioners to the neglect of rational therapeutical doctrines, Dr. Young considers *bleeding* an important remedy at an early period of the malady, for the removal of inflammatory and congestive symptoms, and for obviating the suppuration and debility consequent on them. From six to twelve ounces of blood, he remarks, may be taken away with safety in every incipient case, and the operation may generally be repeated with advantage three or four times, at proper intervals; but to do more than this might justly be called an experiment which, however laudable in proper circumstances, is not to be recommended in the ordinary routine of practice. Dr. Young was himself bled twice, by the direction of his uncle Dr. Brocklesby, and was in favour of small bleedings, to the extent of three or four ounces—locally, when there is pain in any part of the chest. He advises *purgatives* at an early stage, and considers that fears of promoting the diarrhœa by them at this period should not be entertained. He justly views *sulphur* as an excellent aperient in the disease, and especially when complicated with hæmorrhoids. Dr. Young also recommends *emetics*, and prefers ipecacuanha, especially in cases of hæmoptysis, combining it with acetate of lead, or other means, according to circumstances. On *sorbefacients*, especially digitalis, mercurials and alkalies, he places very slight reliance, although they may be prescribed in some circumstances of the disease with advantage. *Epispastics* and *issues* are viewed by him much more favourably. He considers that the tendency to night sweats is not a just reason against the use of *sudorifics*, especially Dover's powder and antimonials. In *expectorants* he has little faith, although ammoniacum, squills, senega, myrrh, and ipecacuanha may be employed with benefit in some cases, in conjunction with hemlock and other *palliatives*. *Demulcents* and *narcotics* are prescribed by him in circumstances indicating their use, sometimes with balsams, the benzoic acid, &c. Of *astringents*, when required to moderate the secretions of the skin and of the intestines, the sulphuric acid is considered the best, especially when conjoined with aromatics and opiates; but he is also in favour of catechu, kino, the extract of logwood, with chalk mixture, or the compound powder of chalk.

287. Dr. Young believes *cinchona* to be the most important *tonic*, and both its advantages and inconveniences to have been exaggerated. He has known it decidedly beneficial at the commencement of the disease, and he has never observed that it increased the hectic symptoms at any period. Besides the powder, and the decoction, he has employed the cold infusion with Seltzer water, in his own case, as well as in others. He has had little experience of *chalybeates*; but he justly remarks that, when they can be taken alone, or with myrrh, as in Griffith's mixture, without increasing cough or pain, — effects which may also proceed from cinchona, — they are sometimes beneficial. The *diet* most favourably mentioned by Dr. Young consists chiefly of milk and the farinacea, especially asses' milk twice daily, cow's milk boiled with soda-water or lime-water, butter-milk, new eggs, vegetable and farinaceous articles. He has found milk boiled with mutton suet of great service. *Exercise* in the open air, riding, walking, &c., are also severally advised. *Change of climate* is recommended, and he considers that the remark of Celsus, that the worst air for the patient is the air which has given rise to the disease, is founded on good sense.

288. I have now brought down the *Historical Sketch* of the treatment of phthisis to a sufficiently recent period. Notices of some more modern writers will appear in the sequel only in so far as they may furnish anything deserving notice. Their works will, however, be mentioned in the *Bibliography* and *References*; so that the reader may be aided in satisfying himself as to the views of those who have written on this difficult subject, or on topics appertaining to it. I shall next endeavour *to state those means of prevention which seem most efficacious against this malady*, and afterwards proceed *to give the results of my experience as to the means which appear to me the most appropriate, or which have been advised for the several stages and states of this disease, conformably with the division above adopted.* (§§ 17. 76. *et seq.*)

289. ii. Of the Prevention of Phthisis.—The full exposition of the *causes* of phthisis which I have given above, and which many readers may consider tedious and unnecessary, will not be viewed in this light, when it is admitted that a knowledge of these causes, and of their modes of operation, is the most certain basis of rational means of prevention. By ascertaining the causes, and the ways in which they act, as far as they may be ascertained, we are enabled either to avoid or to counteract them. When we can neither avoid nor arrest the causes we should endeavour to arrest or to palliate their effects, by means rationally selected and employed,—guided by the lights of science, and by careful observation and induction. The great objects, therefore, of treatment are, in the first place, *to avoid and to counteract the causes of the malady*, and, secondly, when this end cannot be attained, *to arrest or palliate their effects*. The former constitutes the *prevention*, the latter the *cure*, of the disease. But in the procession of morbid conditions from the first impression of the causes, there is an intermediate state between the operation of the causes and the development of their effects in a manifest form, that requires the prompt recognition of the physician, and rational decision as to treatment. This state of incubation — of threatened or incipient phthisis — requires great acumen for its detection, and equal promptness for its arrest. For this state *measures of prevention* should be conjoined with *means of cure*, either predominating according to the circumstances of individual cases.

290. The *prevention* of phthisis is either *radical* and *efficient*, or *conditional* and *uncertain*. The avoidance or removal of the causes is required for the former; the counteraction or the arrest of their

more immediate or early effects is all that can be expected from the latter: the one is *positive*, for the causes have not existed or acted; the other is *contingent*, for the causes have been present, have probably acted and produced their more immediate effects, the means of counteraction or of arresting these effects either succeeding or failing, as numerous circumstances may determine. Prevention thus may be divided into,—first, that which consists of the avoidance of all the causes of the malady; and, second, that which attempts the counteraction, or the removal of their more direct and immediate effects, before the malady is fully developed.

291. *A. The Efficient Prevention of Phthisis* consists in the avoidance and removal of the causes which predispose to, and directly occasion, the malady. Those which affect one or both parents, or which operate during the earliest epochs of childhood, have generally produced their effects upon the constitution before professional advice is obtained. The transgressions of the parent have already injured the offspring, and the scrofulous taint has either been communicated to, or generated in, the child, before efficient measures of prevention could be instituted. The remarks which I have offered on the prevention of SCROFULA (*see* §§ 148. *et seq.*) apply with equal, if not greater, force to the prevention of phthisis. Consumptive persons who marry are even more culpable in this than those who are imbued with the scrofulous diathesis, or who have been affected with external tuberculosis. The offspring of the former may be scrofulous, but the taint is more likely to be manifested in the form of tubercular consumption, whilst the offspring of the latter are more liable to external tuberculosis, although they may be attacked with phthisis, especially when the external malady has not occurred. When the *predisposition*, whether it be hereditary or occasioned by the habits or the diseases of the parents, or by the management of infancy and childhood, has been produced, the radical and complete prevention of the malady can then rarely be effected, the best efforts to this end being merely conditional or uncertain. It is only by the avoidance of those causes which I have arranged under the head of *Causes appertaining to one or both parents*, aided by the removal of *those which usually act during the early epochs of life*, that the efficient or certain prevention of this disease can be expected.

292. *B. The Conditional Prevention of Phthisis*, although uncertain, should not be neglected. Where the predisposition, arising from either the constitution or the health of the parents, already exists prevention may be hoped for, but it cannot be insured.—*a. During Infancy and Childhood* the Hygienic precautions which were offered when treating of SCROFULA (§§ 148. *et seq.*) are even more urgently required when tubercular consumption has appeared in the family of either parent, or when the causes mentioned under the first class of the arrangement have injured the constitution of one or both parents. For children thus circumstanced, a dry, pure, and mild air, considerably elevated above the surface of the sea; frequent change of air; clothing suited to the temperature and season; exercise in the open air; light digestible food, with strict attention to the digestive functions; a milk, farinaceous, and vegetable diet, with a moderate proportion of wholesome animal food, as childhood advances; but the milk of a healthy nurse, asses' milk, &c., during infancy, and the other means advised in the place just referred to, strictly avoiding the causes incidental to this period of life (§§ 49. *et seq.*), are severally of great importance, especially when aided by such other means as the circumstances of individual cases will suggest.

293. *b. During Puberty and Adult Age*, the causes of phthisis which have been noticed as most frequently operating in these epochs of life (§ 184. *et seq.*) should be carefully avoided, especially those which relate to schools, sleeping apartments, &c. A strict surveillance ought to be instituted over youths of both sexes in order to prevent masturbation, and as soon as this vice is detected, its enormity should be represented to the delinquent, and measures taken to prevent the mental contamination from extending to others. The sleeping rooms should be well ventilated; but their temperature ought not to be much lower in winter than that of the sitting apartments, especially for the delicate and predisposed. For these a physical and mental regimen should be enforced, aided by proper food and clothing; by change of air, preferably to a warm, dry and pure air; by chalybeates in forms suited to the peculiarities of the case; and, where the predisposition is manifest, by travelling to and in healthy, warm, or mild and dry countries, as Egypt, Syria, Upper Egypt, South of Spain, or north coast of Africa, &c.

294. These preventive measures are chiefly suited to the rich only; and to these especially hunting, riding, farming in a dry, elevated district, and field sports are remarkably beneficial. The selection of professions and trades for those who are hereditarily or otherwise predisposed to phthisis is attended by great difficulty. Agriculture and the out-door exercises which it involves are salutary to those who can adopt them. Gardening offers some advantages, but these are inferior to those furnished by other agricultural occupations. Poorer persons should become sailors and butchers; but the life of a soldier, even in the best circumstances, is very unfavourable to those in any way predisposed to phthisis. To such persons especially, and even to the most robust, several trades are most injurious. Sculptors, stonemasons, miners, millers, flax, wool, and cotton dressers and workers, weavers, tailors, bakers, milliners, dressmakers, and other needle-women are severally more or less liable to phthisis in consequence of their occupations: and so liable are "dry-grinders," knife, fork, razor, scissor, and needle-grinders to tubercular consumption and other pulmonary diseases, that it has been said by Dr. C. HOLLAND that about one-fourth of those engaged in these occupations died every five years.[*] (See ARTS AND EMPLOYMENTS in *relation to disease*.)

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[*] All nuisances, all dangerous and insalubrious establishments, especially in large towns, besides being productive of several other maladies, are liable to develope phthisis, especially in the predisposed. The government of this country has as yet paid little or no attention to the due regulation of these, as regards the public health; but, in France, as Dr. WALLER LEWIS has recently shown, these establishments are divided into three classes, and before they are permitted to be carried on, certain authorisations and formalities are indispensable. In the first class are placed those establishments that must be isolated from private habitations, but not necessarily from the outskirts of a town; in the

295. iii. **Treatment when Phthisis is threatened.**—When phthisis is imminent, the measures of prevention already noticed, conjoined with others of a more strictly medicinal kind, should be adopted according to the predisposition, age, diathesis, and circumstances of the patient. The digestive and assimilating functions ought to be promoted by the usual means; and especially by change of air, by voyaging, by travelling in warm and dry countries, more particularly in those already mentioned (§ 293.), by suitable clothing, and by attention to the temperature and ventilation of sleeping places. The preventive and curative influences of districts where malaria and the diseases which proceed from this source abound have been insisted on by Dr. Wells and several of his contemporaries. He states that it was common for the consumptive in Flanders to remove to the marshy parts of the country. In Minorca, where agues are endemic, consumption, according to Dr. Cleghorn, is very rare. Dr. Sequeira states, that in the marshy country of Alentejo phthisis is rarely seen. Volney says that consumptive patients are frequently sent from Aleppo to the sea-coast, where intermittents prevail. Other instances are adduced by Dr. Wells in favour of his opinion; and, although it has been controverted by several writers, yet I believe, from several facts with which I am acquainted, that it is not quite devoid of truth.

296. In this, as well as in other periods of the disease, the clothing, especially that worn nearest the skin, should be warm, and the best suited to the preservation of the functions of this part of the frame. With this object flannel ought to be worn during the night and day; and the dress in females should be sufficiently high to protect the upper regions of the chest and the neck. Close cinctures of the chest, and steel supports in corsets are injurious. Due attention ought always to be paid to the digestive and excreting functions, and to the state of the uterine discharges; which are often more or less disordered in the states of the disease now being considered. In many instances cod-liver oil may be of service; in others, as well as in these, sulphuretted or chalybeate springs, or a course of the one following that of the other. For females, the mixture ferri composita, and the decoctum aloes compositum, in varying proportions, according to the state of the bowels, are often of service, especially when the pulse is languid, the catamenia scanty or difficult, and when the cough is not increased or rendered hard or dry by these medicines. In these cases flannel drawers, in addition to the other articles of flannel clothing, and woollen stockings should be worn. In other circumstances, or when the natural secretions and excretions are not suppressed, the infusion, or a weak decoction, of cinchona, with a mineral acid; or other tonic infusions, with aromatics, &c.; or the tinctura muriatis ferri, either with or without the preparations of Calumba and an increased quantity of the acid, may be prescribed, and may even be made the vehicle on the surface of which the cod-liver oil may be taken. Confined positions of the body, the labours of the desk, and close application to either study or business, ought to be avoided; and a due restraint should be placed on the instinctive desires and passions. Mental and physical occupations ought to be pursued as much as possible in open and airy places and apartments, and in a temperature never lower than 60° nor higher than 70°; and should not be such as to fatigue, but such as moderately or pleasantly engage the mind and body.

297. In this state, as well as in the preceding, and more particularly when the predisposition is marked, or the tubercular cachexia manifest, warm or tepid salt-water bathing, or sponging the surface of the body daily with a warm, tepid, or cold solution of salt—the temperature and strength of the solution varying with the state of the patient and the effects produced—is often beneficial; but this practice should always be followed by rubbing the surface smartly with a rough towel, and by the constant use of flannel nearest the skin. Various medicated fluids or lotions have been advised as washes for the chest and neck, in the circumstances now being considered, as well as in the first stage of the disease. Of these, however, the most deserving notice are, a weak solution of the nitro-muriatic acid, a weak solution of the pyroligneous acid, and tar-water, varying in strength with the circumstances of the case. This last lotion has been employed only

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second are included those factories which do not rigorously require their isolation from habitations, but which it is important not to allow until assurance has been obtained that the operations proposed to be carried on in them are executed so as not to be a nuisance to the neighbourhood, and not to cause damage. In the third class are such factories as may remain without inconvenience near dwellings, but which should be subject to the surveillance of the police.

As regards the effects on health of various professions and occupations, it is shown by M. Lombard, that in 1,000 deaths consumption had furnished the following proportions, viz.:—Occupations with vegetable and mineral emanations, 176; with various dusts, 145; with sedentary life, 140; with workshop life, 138; with hot and dry air, 127; with stooping posture, 122; with sudden movements of arms, 116; with muscular exercise and active life, 89; with exercise of the voice, 75; living in the open air, 73; with animal emanations, 60; and with watery vapour, 53. In manufactures the majority of workmen are affected with scrofula; this scourge marks the children and the youths with its scars, swellings, and deformities, and attacks more especially the weavers.

The women furnish more maladies and diseases than the men, partly owing to the comparative paucity of their earnings, from which it arises that the poor workwoman is ill-fed, ill-clothed, and ill-lodged. In one sense, indeed, not money, but the want of it, may be denounced as the root of all evil. So, in this case, "want is a bad adviser, and quickly triumphs over the weak resistance of a conscience without religious light to guide it." Debauchery, followed by excesses of all kinds, comes in to consummate the work of destruction commenced by distress. The worst occupations are those of needlewomen, or *couturières*, dressmakers, embroidresses, and *modistes*, from whose ranks the public women are largely recruited.

The separation of the sexes in workshops is a measure imperiously demanded for the moralisation of the working classes.

As to the healthfulness of employments much depends upon whether they are carried on in the open air or in confined air. Consumption is twice as frequent in the first as in the second case; the latter group comprising occupations carried on in vast spaces well aërated, and in others which confine the workmen in close localities. In the latter phthisis is far more prevalent. The action of dusts on the lungs is in the direct ratio of the volume, weight, and consistence of their molecules. The inhalation of coarse particles is less dangerous than that of dusts finely divided, which penetrate more easily into the last ramifications of the air cells. Dusts from hard substances cause a far greater number of consumptive cases than dust from soft bodies, or of ordinary hardness. The specific gravity of the dusts does not affect in any marked manner the production of phthisis. The order of the respective fatality of dusts is as follows: viz., 1. mineral; 2. animal; and 3. vegetable.—*Report*, &c., by Dr. W. Lewis.

by myself, the temperature of it, as well of the others, being varied according to the feelings of the patient and the state of the air. Friction of the surface also should always follow a recourse to either of these.

298. iv. Treatment of the usual Form of Phthisis. — *Treatment of the First Stage of this Form.* The imminence of tubercular consumption may be viewed almost in the same light as the commencement of this stage; and the treatment advised for the former is altogether applicable to the latter, with various additional means adapted or modified to the circumstances of individual cases. When this stage has commenced, as indicated by the symptoms (§ 187. *et seq.*), the question is no longer, Are tubercles already formed? This must be answered in the affirmative. But their development may be delayed or prevented by judicious treatment; or their absorption may even be procured, although this is a doubtful or rare occurrence. The great principle of treatment in this stage, as well as when the disease is merely threatened (§ 295. *et seq.*), is to develope the powers of life, and increase the vital resistance to the further advance of the malady, without producing or augmenting febrile symptoms: — 1st, By diet and regimen—by Hygienic means; 2nd, By medical treatment. A selection of means belonging to each of these heads, appropriately to the peculiarities of the case, will frequently promote the assimilation of the chyle globules and of the colourless globules of the blood, by supporting or developing the powers of life.

299. *A. The Food and Regimen of the Patient* are of the utmost importance in this stage.—*a.* The *food* has always been discussed, questioned, dogmatically prescribed, and often pertinaciously persisted in, according to the doctrines of the day, and the views of prevailing authorities; and instead of accommodating it to the peculiarities of the case and to the effects produced by it, an indiscriminating mode of administering it has been too generally adopted. At different periods of medical history, and by different physicians, very opposite kinds of food have been recommended. Some have praised a milk diet; others farinaceous and vegetable food only; many a combination of both; some have allowed a large proportion of animal food; and even not a few have permitted the use of fat meats, and a rich, full, and nutritious diet. The praises of certain kinds of diet have often been accompanied by denunciations of all others. Thus the inexperienced, and those who treat a disease according to its name, and not according to the successive pathological conditions it presents, are bewildered, and an important part of the treatment is adopted and applied not more rationally than if it were drawn by lot, or were the turn-up of the die. Now, each of those kinds of diet, modified and added to, according to circumstances, is appropriate and beneficial when appropriately employed, and when aided by a regimen judiciously prescribed. The diet in this stage should always have strict reference to the regimen, which the situation and circumstances of the patient permit, and especially to the locality, temperature, and air in which he resides; and both diet and regimen ought to be directed according to his temperament and diathesis, to the states of vital power and vascular action, as indicated by the pulse and by the febrile symptoms, and to the indications of existing local lesions.

300. When the disease is not ushered in by hæmoptysis, or by indications of active congestion, and especially when it is traced to depressing or exhausting causes, then a nutritious diet, animal food in moderate proportion, the white kinds of fish, boiled, with a squeeze of lemon, with little or no other kind of sauce, and shell-fish, especially oysters, may generally be adopted. The fresh livers of the cod, torsk, ling, haddock, and coal-fish, and the fresh oil of their livers, may be very beneficially used as sauce for these kinds of fish; or the oil may be taken in a more strictly medicinal form soon after a meal. In these and in similar states of the disease even richer and more nutritious kinds of food than those may be tried, and the effects carefully observed. I have often advised a frequent use of fat venison, in some cases, and the fat of lambs or of mutton boiled in milk in others, with much benefit. In cases where this stage is characterised by little or no acceleration of the pulse, by despondency, by a poor state of the blood, and by absence of sub-inflammatory or congestive symptoms, a dry and nutritious diet, or a more full and restorative diet; animal food, consisting of mutton, game, &c., and even wine or malt liquors in moderation, may be allowed, if exercise in the open air, especially horse exercise, short of fatigue, be regularly taken.

301. For persons of a fuller habit of body, or more sanguineous temperament than those just referred to, and especially when oppression, or constriction, or pain at the chest, or a dry, hard cough is complained of, the diet should consist chiefly of milk and of farinaceous and vegetable substances, ripe fruits, &c., and the antiphlogistic regimen should be adopted in every respect; but it should not be carried too far, especially in the scrofulous diathesis. In these cases, local depletions, issues, and other derivatives, as will be hereafter mentioned, should be employed according to the state of the pulse and other peculiarities of the case. For these, buttermilk, whey, and skimmed milk are excellent beverages and aids to diet. After the more inflammatory and congestive symptoms are removed, and when issues or setons have commenced to discharge, then a more liberal and nutritious diet may be allowed, and the cooling, antiphlogistic, and febrifuge medicines hitherto prescribed may be changed for those which are more restorative, and more calculated to support vital power and to promote a healthy assimilation. In these circumstances the fish diet, as advised above (§ 300.), may be first employed, and the more nutritious articles of food be afterwards given with caution.

302. *b.* In this stage, *change of air, voyaging*, more particularly in latitudes from 30° to 50°, or from 10° or 15° to 30° in winter, in vessels possessing comfortable accommodations; *travelling* in temperate and warm climates, with due regard to the temperature and climate and to season; residence in a warm and dry air, the elevation above the surface of the sea, and the degree of atmospheric dryness being such as the patient finds to be most beneficial; regular exercise in the open air, preferably on horseback, and short of much fatigue; are severally of manifest advantage. Exercise on horseback is, however, rarely of benefit to females, and is generally too

exciting, and consequently exhausting to them; walking or driving in an open carriage being more beneficial. In all cases, extremes of temperature, and sudden changes or vicissitudes of temperature must be avoided, even by those who are able to take active exercise, as well as by those who are much less able.

303. *Travelling*, at proper seasons and hours of the day, is generally beneficial, especially when the patient is able to travel on horseback. Travelling on land by other conveyances is less serviceable; although an open carriage, when the weather will admit, is little inferior to riding, especially in the cases of females. But, when a close carriage is used, the patient should sit with his back to the horses; and when he travels by railway, this seat should always be taken, a sufficient ventilation of the carriage being always preserved.

304. *Tepid* and *cold-sponging* and washing the surface of the body, or the surface of the chest merely, with variously medicated lotions, have been advised in this stage; but, excepting with those already mentioned, or with the lotions, liniments, and embrocations about to be noticed, this practice is seldom of much service when this period is far advanced, unless exercise can be regularly taken in the open air, and flannel be constantly worn nearest the skin. It is, however, beneficial when employed as a preventive measure for the predisposed, and for those of a tubercular cachexia (§§ 170, 171.); and when adopted at the commencement of this stage, and followed by very active frictions of the surface.

305. *c.* A *winter residence* is of the greatest importance in this stage to patients in cold or temperate climates, for that residence should be selected which will admit of regular and daily exercise in the open air. But this is not the only consideration by which we ought to be guided. Elevation above the surface of the sea, a situation near the level of or close to the ocean, or removed at a distance from it, and frequent or prolonged voyaging on it, are severally topics which require to be duly considered. As to the last of these — *voyaging* — very well-founded expectations of success from it may be formed, if it be commenced in this stage, or before the second be far advanced, more especially in cases which have been attended by hæmoptysis at their commencement or early course, and if it be continued for a sufficiently long period. Voyaging in the Mediterranean or in the Atlantic between the degrees of latitude named above (§ 302.), and preferably in the Pacific Ocean, especially when prolonged, either in naval cruisers, or by repeated voyages, so as to avoid the winter and spring of this and other countries unfavourable to consumptive patients, deserves to be more frequently recommended that it has hitherto been. Now that the passage across the isthmus of Panama is easy, voyages thence, in various directions in the Pacific Ocean, may be made, and a return to this country effected in May or June.

306. Elevation above the surface of the sea, especially in warm climates, and when dryness of air is attained by elevation, is generally beneficial. Even in temperate climates, where elevation is conjoined with dryness, the diminished temperature which results is not so injurious as generally believed. The cold of Canada is by no means injurious to the consumptive, owing to the dryness of the air being great in proportion to the lowness of temperature. If such a residence admits of regular exercise in the open air, it may be salutary, although a warmer air, and an exemption from sudden atmospherical vicissitudes, may be preferred.

307. The only question connected with residence that remains to be considered is, whether preference should be given to a sea-coast or to an inland locality. This is a difficult question to answer; and judging from the indisputable advantages derivable from sea-voyaging, and the very frequent recommendations of places on the sea-coast by modern physicians as winter residences for the consumptive, it may be inferred that these places are actually the most healthy. But this inference is neither logical, nor practically correct as respects phthisical cases. The benefit derived from voyaging depends chiefly upon uniformity of temperature and the motions of the vessel, aided by the influence of a pure sea-air, on the digestive and assimilating functions. Residences on the sea-coast furnish only two of these elements of benefit, in an imperfect manner, but they are altogether deprived of the third and that which appears to be the most important. We must therefore refer to the results of observation for a decision; and, as far as my experience enables me, I may state, where two localities, one inland the other on the sea-coast, possess equal advantages as to dryness of the air; as to annual, monthly, and daily ranges of temperature; and as to vicissitudes of weather, and facilities for outdoor exercise, that the inland situation should be preferred.

308. Whatever be the locality adopted for the consumptive, or however the patient may be limited in his choice, exercise should not be neglected, in air and sunshine, whilst he is able to enjoy it; and the temperature of his sleeping apartment should not fall below 60° or rise above 70°. The advantages derived from stoves, when properly regulated, are shown by their preservation of the warmth of apartments at all hours of the night; but a due ventilation ought always to be preserved where they are the only means of keeping the temperature at a proper elevation. Having insisted upon regulation of *diet* and *regimen* appropriately to the pathological states of the case in this stage, and upon the advantages of *change of air*, of *travelling*, *voyaging*, and of *suitable residence* during the winter and spring months, the *means* which are more strictly *medicinal* are next to be considered.

309. *B. The strictly medical treatment* of the first stage of phthisis must depend entirely upon the diathesis, temperament, and habit of body of the patient, and upon the states of vascular action, of local lesion, and of vital power. The predisposing and determining causes should also be kept in view; for these should influence or even almost change our indications and means of cure. — *a.* In cases where vascular action is excited, or the pulmonary circulation is oppressed or congested, or where pain is felt in the thorax, or where hæmoptysis occurs without being very copious, neither anæmia nor vital exhaustion being remarkable, *bleeding* ought not to be either neglected or delayed. The only consideration is, in what manner may it be most advantageously resorted to. Venesection, unless the patient be robust

or plethoric, is rarely required. Scarification and cupping are most frequently to be preferred, as the circumstances are few in which this operation may not be efficiently performed, and a due quantity of blood withdrawn in a very short period, the operation itself generally proving a salutary derivative. When the quantity of blood to be taken is small, and in certain complications, the application of leeches may be preferred.

310. The quantity of blood abstracted at one time should be small, or at most not great. In the majority of cases it may vary from four to twelve ounces; this last amount being allowed only where the habit of body and circumstances of the case appear the most to acquire depletion. Time should be allowed to observe the effects of the first bleeding; and after a due interval, if the symptoms still continue, or upon the return of the indications for having recourse to it, the operation may be repeated. The amount and the repetition of the depletions should be determined only by the peculiarities of the case and the judgment of the physician. It will often be observed that even when bleeding appears to be required, it is but ill endured, although the quantity withdrawn has been small. When this stage is developed by the suppression of an accustomed discharge, as of the catamenia, or of hæmorrhoids, then the necessity of having recourse to vascular depletion is obvious, and that method of performing it which is most likely to re-establish the interrupted discharge should be adopted. Leeches may be applied around the anus when the hæmorrhoidal discharge has been suppressed; and beneath the groins when the catamenia are interrupted, difficult, or scanty; and, for both causes of aggravation, calomel, the preparations of aloes, and warm fomentations or the hip-bath, may be prescribed. The older writers advised bleeding from the feet when immersed in hot water, in cases of catamenial obstruction, and this mode may be adopted by those who prefer it. I have sometimes prescribed it, and seen it employed, with benefit.

311. Vascular depletion has been advised in the first stage of phthisis by some authors and reprobated by others. I have now stated many of the circumstances which require it; but there are others, more especially certain complications hereafter to be noticed, which also are benefited by it. But cases are common for which, even at an early period, bleeding cannot be ventured on with safety; or, if employed at all, it can be prescribed only to a small amount, and in the immediate vicinity of parts which appear to require it. The numerous class of cases caused by the depressing and exhausting causes mentioned above (§ 192.), by want, by misery, by debilitating discharges, by confinement and etiolation in factories, close apartments, &c., and by sedentary and ill-rewarded occupations,—those cases which present anæmied, cachectic, discoloured, and debilitated appearances, or in which the pulse is either slow and beneath the healthy condition, or very quick, small, or soft, or when the blood is inferred to be thin and poor in red globules,—are severally injured even by the smallest local depletions, unless they be prescribed for the removal of the pains occasioned by pleuritic complications, for which the additional and often more successful means hereafter to be noticed should be employed.

312. The indications for and against vascular depletion in an early stage of phthisis are, however, not always to be depended upon. Whilst many are manifest, others may be doubtful. Much, therefore, should be left to the close observation, the enlightened experience, and the acumen of the physician, in the interpretation of these indications and the discovery of others. The season, climate, peculiarities of race, modes of living, and prevailing constitution and character of disease, the prevalence of a sthenic or an asthenic condition of morbid action, are severally weighed in his mind before bleeding in any way, its amount and its repetitions are decided upon, and before other important means are prescribed. The prevailing constitution of disease, so much insisted upon by SYDENHAM, differs most remarkably in different periods of time. The sthenic constitution, so general in the first quarter of the present century, was changed to the asthenic in the second quarter, and this latter still appears to continue. The vital energies of the residents in large cities and manufacturing towns, especially in low situations, are weaker than those possessed by the inhabitants of rural districts and elevated localities; and these differences, with others manifested by individual cases, require due consideration when devising our indications and means of cure.

313. The necessity of having recourse to vascular depletions, especially to local depletions, when congestion, sub-inflammatory action, pain, the state of respiration or of cough, or other symptoms, require them, does not necessarily prevent the exhibition of nutrient and even of restorative means, more particularly when vital power appears depressed and vascular action is not much increased. Indeed, in large cities and manufacturing towns, these latter medicines, or even more tonic remedies are often required, although local depletions are equally necessary for the local lesions. For these milder tonics, conjoined with sedatives and narcotics, as the infusions of cheyreita or calumba, with hydrocyanic acid, or conium, or hyoscyamus, or the tinctura camphoræ comp., may be first prescribed, and be followed, according to the effects observed by infusions or decoctions of a more tonic kind. When, with debility, a cachectic or an anæmied appearance is present, the preparations of iron may be given, commencing with the mildest. I have generally preferred the mistura ferri composita, with the extract or tincture of conium, or the powder or extract of liquorice; and, if the bowels be sluggish, and the catamenia be deficient, with a sufficient quantity of the decoctum aloes compositum, or tinctura aloes.

314. The effects of chalybeates of every kind require to be closely observed in this as in every other stage and state of the disease. This class of medicines are contra-indicated where any inflammatory complication exists, or where a tendency to hæmoptysis is observed, unless hæmorrhage has occurred to a large amount, when the tinctura ferri hydrochlorici, with additional acid and appropriate medicines, may be given in a suitable vehicle; but on all occasions the effects of chalybeates on the respiration and the cough should be strictly watched, and, if rendered more oppressed, difficult, or hard by them, they ought to be relinquished. I have often prescribed the

iodide of iron, in syrup of sarzæ, or in other syrups, with conium; or some other anodyne; but I have not considered it more beneficial than Griffith's myrrh mixture, even in cases where the catamenia are deficient; and I have found it in some cases to aggravate the cough and tightness of the chest more than that mixture.

315. When the above medicines are either not indicated or prove inefficacious, the infusions of cinchona, prepared either with cold or with warm distilled water, may be prescribed with hydrocyanic acid, or with any of the preparations of conium or hyoscyamus; and it may be taken in milk in which a little of the bicarbonate of potash, or of soda has been dissolved. When febrile symptoms harass the patient, the liquor ammoniæ acetatis may be given with the infusion of cinchona, and the spirit of nitric ether and hydrocyanic acid added to them. In some instances the liquor ammoniæ acetatis may be prescribed with an excess of acetic acid, especially where hæmoptysis occurs; and in others, particularly where sinking or exhaustion is present, with an excess of the carbonate of ammonia, other substances which the symptoms will suggest being also added.

316. In this early period of phthisis the functions of digestion—of both stomach and liver, are often more or less impaired; and it is often beneficial to them, as well as to the state of circulation in the lungs, to commence the treatment with an *emetic*. The older writers recommended this practice, and experience has shown that, when the emetic has been judiciously selected, and the treatment otherwise appropriate, benefit has been produced by it. The Italian physicians, and after them Laennec and his pupils, prescribed tartarised antimony as an emetic in this disease, having, as they believed, derived great advantage from it in the more strictly inflammatory diseases of the lungs; and not only did they employ it as an emetic, but as a contra-stimulant, and in doses which were seldom efficacious in reducing the febrile symptoms, but which rarely failed in reducing the vital powers of the patient. I frequently saw the effects of this substance whilst it was in vogue, and sometimes prescribed it; but I considered it of inferior utility to ipecacuanha and to sulphate of zinc as an emetic in phthisis, their operation being facilitated and increased by a draught of a weak infusion, tepid, of camomile flowers. Afterwards demulcents or emollients, or stomachics, with the addition of a little hydrocyanic acid, if the retching or vomiting be more than we desire, may be prescribed, and subsequently the other internal remedies which the features of the case will suggest.

317. The effect of the emetic early in this stage, and the repetition of it when the functions of digestion are disordered, will generally be beneficial, as shown by the appetite and the state of the evacuations, especially when followed by the medicines just mentioned, or by small doses of the nitro-muriatic acids taken in the tonic infusions already noticed, or in others which the state of the case appears to require. If the bowels become irritable, the tinctura camphoræ comp., or the pilula saponis composita, will correct the disorder; the former being given in the mistura cretæ, or any other suitable vehicle or form of combination, the latter with small doses of ipecacuanha, and of an aromatic powder. If the biliary secretion be deficient, as not infrequently observed in this period, although the bowels are relaxed, Plummer's pill or blue pill may be cautiously given, with soap and extract of taraxacum, instead of the nitro-muriatic acids; or these latter may be prescribed instead of the mercurial, an occasional dose of which should only be taken. In this stage of the disease the bowels are more frequently confined than much relaxed, and the intestinal secretions and excretions are very often more or less disordered. It thus becomes an important object to improve these secretions, and to regulate the function of defæcation. The medicines just named will often aid in attaining this end; but they require to be either conjoined with others, or followed by suitable laxatives or aperients, conjoined with vegetable tonics, stomachics, &c. I have also observed great benefit result from the following, when appropriately administered or modified:—

No. 350. ℞ Pulv. Ipecacuanhæ, gr. viij.;—Extracti Fellis Bovini, ℈ij.;—Pilulæ Rhei comp. (vel Pil. Aloes cum Myrrhâ) ℈ijss.;—Extr. Conii (vel. Extr. Hyoscyami), ʒss.;—Saponis Castil. gr. xij.;—Olei Anisi, q. s. Contunde bene et divide massam in pilulas xxxvj. quarum capiat duas horâ somni.

No. 351. ℞. Extr. Glycyrrh. ʒss.;—Tinct. Aloes comp. ℥ss.;—Tinct. Conii, ʒj. (vel Tinct. Hyoscyami, ʒij.);—Decocti Aloes comp. ℥vss. Aquæ Carui ad ℥viij. Misce. Fiat mist. cujus capiat cochl. ij. vel iij. ampla horâ somni vel primo mane.

No. 352. ℞ Pilulæ Rhei comp. ℈ij ss.;—Pilulæ Scillæ comp. et Pilulæ Conii comp. aa. ℈j.;—Saponis Castil. gr. x. Contunde bene et massam divide in pilulas xxiv. Sumantur binæ hôra somni.

318. These medicines are most suitable in cases devoid of any inflammatory complication, which, as occurring either in this or in subsequent stages, will be more particularly considered in the sequel. The objection of not being applicable to these and other complications cannot, however, be urged against equal proportions of magnesia and sulphur as an aperient in this stage, especially when rendered more agreeable by the addition of liquorice powder and a little ginger. Where this aperient proves too depressing, or where vital power and vascular action and assimilation are much impaired, a little powdered cascarilla may be added to the former, the whole being taken in some water.

319. *b. External Medication* is a very important part of the treatment of phthisis; and, as will be seen from the historical sketch given above (§ 242. *et seq.*), it has been considered such from a very early period of medical history. Probably external derivation by means of moxas was as early resorted to in eastern countries for this and other diseases, as by issues and setons among the Greeks and Romans; but there can be no doubt of the benefit to be derived from these and similar means in aid of judicious internal treatment and regimen. As it was in respect of internal, so it has been as regards external means, different kinds and various modes of prescribing them having been advised in successive ages, and those which had fallen into disuse having been revived from time to time, again to be neglected or forgotten. The moxas employed in far eastern countries from time immemorial came into vogue in Europe after the former were visited by voyagers and travellers from the latter; but failed in superseding issues and setons, which have always held their place, and deservedly, in

the treatment of this disease, especially with the judicious and experienced. Early in the present century moxas came again into use in some places on the continent of Europe, and pustulation by means of tartarised antimonial ointment, or of croton oil in this country; the latter means having so entirely superseded issues and setons, as to have caused the complete disuse of them. I have seen much of these modes of derivation, and have had considerable experience of their effects, both in phthisis and in other diseases. *Moxas* are of more or less use according to the amount of discharge which may be procured subsequently to their incandescence; but their operation is uncertain. Both the tartarised antimonial ointment and the croton oil liniment produce external irritation, but little discharge, their influence on the disease being seldom beneficial, while they distress the patient and even augment the constitutional disturbance in some cases.

320. *Issues*, made sufficiently large, have proved most beneficial in my practice. I have always prescribed them when I have seen the patient in the first, or even in the second stage, and several persons are now alive who had recourse to them from twenty to thirty years ago, as I advised them. I have generally recommended them to be made near the margins of the ribs, when the patient is not much emaciated; or in any other situation which may be preferred. The chief objection to them is the preliminary measure of destroying the integuments for the lodgment of the peas. Where *setons* appear preferable, as respects the state of the patient, or the situation in which they may be inserted, so as least to incommode him, care should be taken, in respect of them as well as of issues, that they should be sufficiently large to be effective, and that a free purulent discharge be uniformly procured from them. When both issues and setons are objected to, especially the formation of an issue in the usual way, then the inner bark of the mezereon, previously moistened, may be placed on a part of the surface of the extent of a crown-piece, and confined there by means of a larger piece of adhesive plaster spread on paper or leather, the bark being renewed from time to time. This latter plan, however, is not preferable to a blistered place of this extent kept open and discharging by the usual means; but neither the one nor the other is so effective as an issue or a seton, the benefit being derived chiefly from a uniformly copious discharge. When this is procured, the internal treatment and regimen of the patient should be more restorative and generous than in other circumstances of the disease; tonics, chalybeates, animal food, restorative beverages, &c., being allowed, according to the peculiarities of the case, especially as respects the vital and vascular conditions.

321. I have since 1819 never neglected to prescribe an embrocation to the chest, in phthisis and in some other diseases, which acts less as an external irritant and derivative than as a source from which a salutary agent is inhaled into the lungs in so mild a form as neither to irritate nor to stimulate, whilst it is slightly absorbed. This embrocation I have employed in many internal diseases, in various forms or modifications, as a liniment, or as an embrocation or epithem—sprinkled on folds of flannel, or on spongeopiline, and covered over by a napkin, or otherwise,—and varied as respects the constituents, the principal one being always present.

No. 353. ℞ Linimenti Terebinthinæ,—Linimenti Camphoræ compositi, aa. ℥jss.;—Olei Olivæ, ℥ss. ad ʒvj.;—Olei Cajuputi, ʒj. ad ʒjss. Misce et sit embrocatio.

No. 354. ℞ Linimenti Terebinthinæ,—Linim. Saponis cum Opio, aa. ʒij.;—Linim. Camphoræ comp. ℥jss.;—Olei Cajuputi, ʒjss. Misce.

322. When it is desired that external irritation should follow the first of these, the olive oil may be omitted. Either of these should be renewed every night, the vessel being previously shaken, and applied, by the means already mentioned, to a sufficiently large surface, either of the front, or of the back of the chest, or of the side, where pain or uneasiness is most felt. It should be kept applied all night, or the following day, and even be renewed again in the morning, the quantity sprinkled over the surface of the flannel or spongeopiline being sufficient to moisten, or more completely to wet these substances, according to the effect we wish it to produce, whether by inhalation of the fumes proceeding from it, or by the external derivation it may occasion, in addition to the former mode of action.

323. Blisters, mustard poultices, the cauteries, urtication, and dry-cupping have severally been resorted to as derivatives in this stage. Blisters are often of much service, especially when applied after local depletions; and when a discharge has been procured from them for some time. The others, excepting the cauteries, are seldom productive of much or permanent benefit. The tartarised antimonial ointment and liniments with croton oil have deservedly fallen into disuse. The actual and potential cauteries were not infrequently employed in former times for this disease, a discharge from either having always been promoted. They are now never resorted to in phthisis.

324. *c.* In this, as well as in more advanced stages of the disease, the *inhalation* of medicated vapours, and of certain fumes, effluvia, and odours has been recommended and been adopted. I have, however, very rarely observed much benefit derived from it, especially as commonly employed by means of an inhaling apparatus. The substances, also, generally prescribed for inhalation have been used in so concentrated a form, or are so acrid or stimulating, as often to increase the existing irritation in the bronchi, or the morbid action in the substance of the lungs, and in the seats of vomicæ or of cavities. It is also very questionable whether or no the inhalation of vapours,—whether watery, emollient or anodyne, or narcotic, or possessed of all these properties,—is actually beneficial in phthisis, more especially at an early period of the malady. The inhalation of these may be useful as palliatives at an advanced stage, especially when an irritable cough, a sense of constriction in the chest, difficult expectoration, &c., are much complained of; but, in other circumstances and stages of the disease, they only tend to obstruct or impair the functions of the lungs, by interrupting the progressive metamorphosis and oxygenation of the globules of the blood, and by favouring congestion or a partial collapse of the organ. The modes of inhalation, or of having recourse to the respiration of the effluvia of substances which are calculated to prove beneficial in this disease, will be considered in the sequel.

325. *C. Treatment of the second stage of the common form of phthisis.*—At the commencement of this period, or when the symptoms, especially the appearances of the expectoration, and the character of the febrile action, indicate the recent supervention of this stage on the first, then it will become a question how far the means which have been, or still are, in use, may be continued, and in what they may be modified or changed, or what additions may be made to them. In this the physician will be guided by the peculiarities of each case; but, in the circumstances of most, the same principles and means as have been discussed should be continued, modified so as to meet prominent symptoms, and commencing or fully developed complications, or intercurrent affections. The softening of the tubercles in this stage is generally attended by an increase of cough and expectoration, of the hectic symptoms, and of the morning perspirations, with occasional attacks of diarrhœa or disorder of the bowels. One or more of these usually become more prominent as the disease advances; or other phenomena are superadded, requiring the treatment to be directed more especially to them.

326. *a.* The *cough* generally suggests palliatives, in connection with the other means which the state of the patient demands. Thus hydrocyanic acid, or henbane, or hemlock, or the compound tincture of camphor, may be added to mixtures containing the liquor ammoniæ acetatis, and any demulcent which may appear most appropriate to the nervous and vascular conditions of the case; or they may be conjoined with bitter or tonic infusions or decoctions, when the states of the pulse, of the fever, and of the vital powers, require them; these latter are often rendered more beneficial by the addition of the solution of the acetate of ammonia, and of the sweet spirits of nitre. Where there is much pallor of the surface, the pulse being either weak or but little accelerated, any of the anodynes above mentioned may be added to the mistura ferri composita, and the effects upon the cough and upon the hectic and other symptoms carefully observed.

327. *b. The perspirations* during the night or early part of the morning are always productive of great exhaustion, and are the most difficult to restrain or prevent. They have been very differently treated by both ancient and modern physicians, but most frequently by mineral acids, and by various refrigerants, astringents, and tonics, as shown in the historical sketch given above (§§ 241. *et seq.*). Either of these may be prescribed in combinations suited to the case, with emollients, stomachics, or tonics, and may be made the vehicle, on the surface of which the recent *cod-liver oil* may be taken shortly after a meal, twice or thrice daily, and in sufficient quantity; this being the substance most deserving of reliance for moderating this distressing symptom. Some of the medicines advised with this object have often disordered the bowels, or induced an attack of diarrhœa, and even augmented the suffering of the patient without effectively diminishing the perspirations and their consequent exhaustion; but these results rarely follow from the use of this oil. The mistura ferri composita is sometimes of service in allaying the severity of the hectic and the excessive perspirations, especially when there is no inflammatory complication present, and when it neither produces headache nor renders the cough harder or more severe. Dr. WATSON has found the tinctura ferri muriatis successful in allaying the perspirations after other means had failed. The dose he prescribes of this medicine is twenty minims thrice daily. I have likewise given this preparation, with advantage, in the infusion of calumba, with an additional quantity of the acid, and have sometimes made this combination the vehicle on the surface of which the cod-liver oil was taken.

328. *c.* When *diarrhœa* occurs it is often induced by some purgative medicine, or by errors in diet, or by means employed to moderate the perspirations. The cause of it should be ascertained, and the medicines to restrain it be suggested or selected accordingly. It is, however, frequently independent of either of these causes, and the result of indigestion—of the acidity and the accumulation of sordes in the *prima via* consequent upon the imperfect performance of the functions of primary assimilation. In either of these circumstances antacids and absorbents, conjoined with mucilages, anodynes, or narcotics, or with mild tonics, will prove of service; as the cretaceous mixture with the compound tincture of camphor, or the tincture of hop, &c., and with the tincture of catechu, or with other vegetable astringents, if they be required. But the bowels should not be confined by these or other medicines; and when there is any risk of such an occurrence magnesia may be given with sulphur or rhubarb, or with cascarilla; or the compound decoction of aloes may be prescribed with the tincture or with other suitable medicines.

329. *d.* In this stage of the disease *emetics* and *bleeding* are seldom beneficial, unless the states of the digestive and respiratory functions require a recourse to the former, and the occurrence of pain or the appearance of an inflammatory or congestive complication demand the latter. Ipecacuanha is in most instances the best emetic, and local bleeding the most beneficial, especially when the embrocation prescribed above (§ 321.) is afterwards applied and duly persisted in. Although it may be necessary to have recourse to these means, others of a restorative or even tonic kind—both medicinal and regimenal—may be equally required; often, however, in different cases, but not infrequently in the same case, and sometimes even soon after the more antiphlogistic measures have been employed. Generally, when local depletions are required, febrifuge medicines, chiefly such as the solution of the acetate of ammonia, camphor mixture, &c., are the most appropriate; but they may be afterwards conjoined with others of a more tonic nature, such as the infusion of hop or the infusion or decoction of cinchona, and to these anodynes may be added; the selection of which should depend upon the features of the case. Hydrocyanic acid, monkshood, hemlock, henbane, meadow-saffron, and digitalis, have been individually employed in combination with these or other medicines; but they require caution in their use, and careful observation of their effects. Monkshood or *aconite* is most appropriate in the more inflammatory tendencies of this and the preceding stage, but it especially demands a most cautious observation of its effects; a remark not less applicable to colchicum and digitalis, which are suited to the same states of the disease as those for which ac-

nite may be given; these being useful chiefly as antiphlogistic means, either in aid of vascular depletion, or when the condition of the blood and of vital power contra-indicate a recourse to depletion; although the local morbid action requires to be restrained or even lowered.

330. *e.* The remarks offered above respecting *issues*, *setons*, and other derivatives (§§ 319—323), apply to this, as well as to the first stage. Instances are rare in which either the one or the other should not be resorted to. The great difficulty often is, owing to the emaciation of the patient, in which situation they may be placed, so as to produce the least amount of discomfort. When emaciation is not very remarkable, then the margins of the ribs may be selected; but in different circumstances an issue of good size may be formed over the pectoral muscle, or between the shoulder-blades. When this stage in females is characterised by suppression or marked diminution of the catamenia, the issue may be made near the groin, in the anterior aspect of the thigh. When setons are preferred, the arm, near the axilla, may be selected. If neither of these, nor moxas be adopted, *blisters*, kept open as long as possible and renewed from time to time, are generally necessary. The *embrocations* advised above (§ 321.), ought not to be overlooked, inasmuch as, in the more urgent cases, they may be applied whilst the foregoing means are also in operation, and as they are sources both of derivation and of inhalation. When the above produce a sufficient discharge, then Griffith's myrrh mixture, or other chalybeates or tonics, may be prescribed, with anodynes, narcotics, &c.; and their effects upon the cough, the pulse, and the hectic should be carefully observed. If these symptoms become aggravated by them, they ought to be relinquished, and the salines, especially the solution of acetate of ammonia, or of citrate of potash, with hydrocyanic acid, conium, &c., as noticed above (§ 329.), may be substituted. If these effects do not result, then the more generous regimen recommended for the first stage (§§ 314. *et seq.*) is equally, if not even more, required for this.

331. *f. Inhalation* of dilute medicated vapours and fumes may be tried in this stage, as well as in the first. The opinion I have formed of them, and stated with reference to that period (§ 324.), is not materially different as regards this. Cases may occur in which they will be more serviceable in the second than in the first stage, and still more so in the third than in either of the foregoing: but the amount of benefit, or the want of it, will entirely depend upon the substances selected for this mode of administration, and upon the way of effecting this intention (*see* § 412.). But mild or weak *fumigations* of the patient's apartment are generally much more beneficial than inhalations, which often irritate and increase the local lesions (§ 413.).

332. *g.* In females the state of the *catamenia*, as respects both the intervals and the duration and quantity of the discharge, is of the greatest importance, especially in the first and second stages of the malady. Excessive discharge, whether as to frequency of recurrence, the duration of its continuance, or the quantity, not infrequently predisposes to, or more directly occasions, phthisis; and the same disorders of this function, if allowed to proceed, will also aggravate or hasten the progress of this malady, if they occur in either the first or second stages. The rapid or sudden disappearance of this discharge, on the other hand, is even more certainly and rapidly injurious, in whatever stage this may take place. A difficult or scanty catamenial discharge requires attention, although it is not so dangerous as either of the former states, especially the latter. Excessive states of the catamenia should be moderated with caution and by such means as are not likely to be followed by suppression. The decoction or infusion of cinchona with either of the mineral acids, or the sulphate of quinine in the compound infusion of roses, and tincture of orange-peel may be prescribed, or the sulphate of quinine may be mixed in some water and taken without any addition. If anæmia have been produced by this discharge, the tincture of the sesquichloride of iron may be given, either alone, or with the preparations of calumba or quassia. It should not be overlooked, that the disorders of the catamenia in the early stages of phthisis are often occasioned by masturbation; and when this is suspected, and when advice can prudently be given and precautions taken against this vice, it becomes the duty of the physician to act accordingly. In these, as well as in other circumstances of profuse catamenia, ipecacuanha, conjoined with extracts of gentian, catechu, and a narcotic, may be given in such quantity as to occasion some degree of nausea to even retchings.

333. Scanty or difficult menstruation requires means appropriate to the peculiarities of the case; for either of these states may be attended, in one patient, with an anæmied or chlorotic appearance, and, in another, with little or no apparent deficiency or poorness of blood. In the former case, the compound mixture of iron, with as much of the compound decoction or the tincture of aloes as will act moderately on the bowels, or prevent constipation, with a little of the extract or tincture of conium, will generally be of service. In other cases, where there is no deficiency of blood, a few leeches may be applied below the groins shortly before the expected period of the catamenia; and the hip-bath and pediluvia, at a sufficiently warm temperature and with the addition of salt or mustard, resorted to.

334. In cases attended by suppression of this discharge, strenuous efforts should be made to restore them. The hip-bath, pediluvia, &c., rendered stimulating by bay salt and mustard, leeches applied around the anus, or beneath the groins, the preparations mentioned above (§ 333.), walking exercise, or riding on horseback or in a carriage, and the several emmenagogues advised for suppression of the catamenia (*see* Menstruation, §§ 64—95. *et seq.*), should be prescribed in combinations or forms suited to the state and stage of the pulmonary disease.

335. In this stage various complications appear, either as temporary or intercurrent affections, or as morbid associations, which continue to the termination of the malady. There will be noticed in the sequel; but there is one which is rarely absent, and which renders the treatment difficult, namely, the bronchitic affection. This in many cases becomes the prominent disorder, and requires the treatment to be more especially directed to it; the most generally ser-

viceable means being, according to the accompanying fever and the state of the patient, the solution of the acetate of ammonia with the spirit of nitrous ether, dilute hydrocyanic acid and camphor mixture; or in somewhat different states, with carbonate of ammonia, compound tincture of camphor, or henbane or conium. If there be a hæmorrhagic tendency, the acetic acid may be added; and in most cases the terebinthinate embrocation should be applied to the chest.

336. *h.* The *diet* and *regimen* in this stage may, in a very large proportion, if not in the majority of cases, be altogether the same as I have advised for the prevention and for the treatment of the first stage of the disease (§§ 292—308.). In many cases a fish diet will agree well in this stage; the white kinds of fish, always boiled, but never fried, a squeeze of lemon, with little butter, but preferably with the liver of fish, being the chief or only sauce. The fish and their livers, which are most beneficially used as articles of diet, are the *Gadus brosmius*, or torsk; the *Gad. morrhua*, or cod; the *Gud. molua*, or ling; the *Gad. æglefinus*, or haddock; the *Gad. merlangus*; the *Gad. callarius*; the *Gad. carbonarius*, or coal-fish; the *skate*, *turbot*, *soles*, &c. The recent livers of all these species of the genus Gadus, boiled in such a manner as to preserve their oil, may be used either as sauce to the fish, or may be ate with it, or the oil may be taken after the meal, in the usual medicinal way. They are beneficial both as articles of diet and as medicine. When quite recent they have no fishy or unpleasant flavour, and are easily digested, — the more easily the more oil they contain.

337. As to other articles of *diet*, *regimen*, *change of air*, *exercise*, *travelling*, *voyaging*, and *choice of residence*, the remarks which I have made above (§§ 292—308.), and in the sequel (§§ 420, 421.), and in the article Climate (§§ 42. *et seq.*) are applicable to this stage, according as the strength of the patient and the prominent symptoms will admit of their adoption; and as the presence or absence of any of the more important complications will suggest.

338. *D. The treatment of the third stage of the common form of phthisis* (§§ 38. *et seq.*), is frequently but little different from that already advised. The state of the patient may not, in some instances, be materially different from that characterising the second stage, although cavities — one or more — have already formed in one or even both lungs. The patient may not be materially worse in respect either of strength or degree of emaciation, or of cough and respiration, especially if the more aggravated symptoms and complications have not as yet been experienced. More commonly, however, he is much worse as regards all these; and colliquative perspirations, attacks of diarrhœa, severe paroxysms of cough and of oppressed breathing, and pains in various parts of the chest or its vicinity from inflammatory congestion of portions of the lungs or from the extension of the morbid action to the pleura, are more or less experienced, and are generally relieved with greater difficulty than in the preceding stages. The treatment depends chiefly upon the complication, or rather complications, which characterise this stage.

339. *a.* In all cases there is more or less *bronchitis*, chiefly, however, of the bronchi communicating with the softened tubercles and cavities; but there may be in addition *inflammatory*, or *sub-inflammatory action* in the surrounding portions of lungs, or even also in parts of the pleura in the vicinity. These may require, or at least suggest, a treatment which neither the strength nor vascular condition of the patient may well bear, especially when carried so far as to subdue the super-induced local mischief. But to leave these complications to their natural courses, when clearly manifested by symptoms, may be more injurious than the effects of judicious means prescribed for their removal; and, as far as my experience enables me to decide, the employment of such means is the safest alternative. For these states of this stage, therefore, local depletions, by leeches or by cupping, are required according to the condition of the patient and symptoms of the case, the quantity of blood taken at first being small. When the indications for having recourse to this measure are doubtful, dry-cupping, afterwards blisters, the terebinthinate embrocations already advised (§ 321.), and the febrifuge medicines recommended above, are most appropriate. Of this class of medicines, the solution of acetate of ammonia, in forms and combinations already noticed (§ 315.), is the most generally of service.

340. *b.* In this stage, especially in its advanced course, the colliquative perspirations and diarrhœa exhaust the patient and more or less waste the red globules of the blood. Whilst these symptoms should be restrained, the powers of life and the supply of duly assimilated blood-globules must be supported and promoted. The means which fulfil the one indication often also aid the other. This is more particularly demonstrated by the effects of cod-liver oil, and by medicines which improve the digestive and assimilating processes, and correct, counteract, or remove the contaminating matters which are carried into the circulation from the lesions seated in the lungs, whether softened tubercles or ulcerating cavities, and which thereby affect the cutaneous and mucous surfaces and follicles, so as to give rise to these exhausting and distressing symptoms of the malady. Numerous means, beside those already mentioned, have been proposed for these morbid conditions, especially the acetate of lead with pyroligneous acid and laudanum, the sulphate of zinc with sulphuric acid, the sulphate of copper with opium, the substances containing tannin, gallic acid, &c., and catechu, kino, krameria, hæmatolylum, nux vomica, &c.; but very few of these, even while they restrain the diarrhœa, diminish the perspirations, or in any other respect alleviate the malady. Indeed, in some cases they aggravate the disease, and only accelerate its progress to a fatal issue by preventing the elimination by those emunctories of the effete, morbid, and contaminating materials conveyed into and circulating in the blood.

341. *c.* Much more rational and efficient *indications* for the abatement of the colliquative diarrhœa and perspirations in phthisis would be the improvement of the digestive and assimilating functions by such means, or combinations of means, as would at the same time, by their partial absorption into the circulation, correct, change, or counteract the contaminating matters which are imbibed from the seat of the disease; whether these matters be purulent or tubercular, or the sanious fluid formed in or on the surface of ulcerating parts, and whether they are actually present in the blood or are more or less changed

nite may be given; these being useful chiefly as antiphlogistic means, either in aid of vascular depletion, or when the condition of the blood and of vital power contra-indicate a recourse to depletion; although the local morbid action requires to be restrained or even lowered.

330. *e.* The remarks offered above respecting *issues*, *setons*, and other derivatives (§§ 319—323), apply to this, as well as to the first stage. Instances are rare in which either the one or the other should not be resorted to. The great difficulty often is, owing to the emaciation of the patient, in which situation they may be placed, so as to produce the least amount of discomfort. When emaciation is not very remarkable, then the margins of the ribs may be selected; but in different circumstances an issue of good size may be formed over the pectoral muscle, or between the shoulder-blades. When this stage in females is characterised by suppression or marked diminution of the catamenia, the issue may be made near the groin, in the anterior aspect of the thigh. When setons are preferred, the arm, near the axilla, may be selected. If neither of these, nor moxas be adopted, *blisters*, kept open as long as possible and renewed from time to time, are generally necessary. The *embrocations* advised above (§ 321.), ought not to be overlooked, inasmuch as, in the more urgent cases, they may be applied whilst the foregoing means are also in operation, and as they are sources both of derivation and of inhalation. When the above produce a sufficient discharge, then Griffith's myrrh mixture, or other chalybeates or tonics, may be prescribed, with anodynes, narcotics, &c.; and their effects upon the cough, the pulse, and the hectic should be carefully observed. If these symptoms become aggravated by them, they ought to be relinquished, and the salines, especially the solution of acetate of ammonia, or of citrate of potash, with hydrocyanic acid, conium, &c., as noticed above (§ 329.), may be substituted. If these effects do not result, then the more generous regimen recommended for the first stage (§§ 314. *et seq.*) is equally, if not even more, required for this.

331. *f. Inhalation* of dilute medicated vapours and fumes may be tried in this stage, as well as in the first. The opinion I have formed of them, and stated with reference to that period (§ 324.), is not materially different as regards this. Cases may occur in which they will be more serviceable in the second than in the first stage, and still more so in the third than in either of the foregoing: but the amount of benefit, or the want of it, will entirely depend upon the substances selected for this mode of administration, and upon the way of effecting this intention (*see* § 412.). But mild or weak *fumigations* of the patient's apartment are generally much more beneficial than inhalations, which often irritate and increase the local lesions (§ 413.).

332. *g.* In females the state of the *catamenia*, as respects both the intervals and the duration and quantity of the discharge, is of the greatest importance, especially in the first and second stages of the malady. Excessive discharge, whether as to frequency of recurrence, the duration of its continuance, or the quantity, not infrequently predisposes to, or more directly occasions, phthisis; and the same disorders of this function, if allowed to proceed, will also aggravate or hasten the progress of this malady, if they occur in either the first or second stages. The rapid or sudden disappearance of this discharge, on the other hand, is even more certainly and rapidly injurious, in whatever stage this may take place. A difficult or scanty catamenial discharge requires attention, although it is not so dangerous as either of the former states, especially the latter. Excessive states of the catamenia should be moderated with caution and by such means as are not likely to be followed by suppression. The decoction or infusion of cinchona with either of the mineral acids, or the sulphate of quinine in the compound infusion of roses, and tincture of orange-peel may be prescribed, or the sulphate of quinine may be mixed in some water and taken without any addition. If anæmia have been produced by this discharge, the tincture of the sesquichloride of iron may be given, either alone, or with the preparations of calumba or quassia. It should not be overlooked, that the disorders of the catamenia in the early stages of phthisis are often occasioned by masturbation; and when this is suspected, and when advice can prudently be given and precautions taken against this vice, it becomes the duty of the physician to act accordingly. In these, as well as in other circumstances of profuse catamenia, ipecacuanha, conjoined with extracts of gentian, catechu, and a narcotic, may be given in such quantity as to occasion some degree of nausea to even retchings.

333. Scanty or difficult menstruation requires means appropriate to the peculiarities of the case; for either of these states may be attended, in one patient, with an anæmied or chlorotic appearance, and, in another, with little or no apparent deficiency or poorness of blood. In the former case, the compound mixture of iron, with as much of the compound decoction or the tincture of aloes as will act moderately on the bowels, or prevent constipation, with a little of the extract or tincture of conium, will generally be of service. In other cases, where there is no deficiency of blood, a few leeches may be applied below the groins shortly before the expected period of the catamenia; and the hip-bath and pediluvia, at a sufficiently warm temperature and with the addition of salt or mustard, resorted to.

334. In cases attended by suppression of this discharge, strenuous efforts should be made to restore them. The hip-bath, pediluvia, &c., rendered stimulating by bay salt and mustard, leeches applied around the anus, or beneath the groins, the preparations mentioned above (§ 333.), walking exercise, or riding on horseback or in a carriage, and the several emmenagogues advised for suppression of the catamenia (*see* Menstruation, §§ 64—95. *et seq.*), should be prescribed in combinations or forms suited to the state and stage of the pulmonary disease.

335. In this stage various complications appear, either as temporary or intercurrent affections, or as morbid associations, which continue to the termination of the malady. There will be noticed in the sequel; but there is one which is rarely absent, and which renders the treatment difficult, namely, the bronchitic affection. This in many cases becomes the prominent disorder, and requires the treatment to be more especially directed to it; the most generally ser-

viceable means being, according to the accompanying fever and the state of the patient, the solution of the acetate of ammonia with the spirit of nitrous ether, dilute hydrocyanic acid and camphor mixture; or in somewhat different states, with carbonate of ammonia, compound tincture of camphor, or henbane or conium. If there be a hæmorrhagic tendency, the acetic acid may be added; and in most cases the terebinthinate embrocation should be applied to the chest.

336. *h*. The *diet* and *regimen* in this stage may, in a very large proportion, if not in the majority of cases, be altogether the same as I have advised for the prevention and for the treatment of the first stage of the disease (§§ 292—308.). In many cases a fish diet will agree well in this stage; the white kinds of fish, always boiled, but never fried, a squeeze of lemon, with little butter, but preferably with the liver of fish, being the chief or only sauce. The fish and their livers, which are most beneficially used as articles of diet, are the *Gadus brosmius*, or torsk; the *Gad. morrhua*, or cod; the *Gad. molua*, or ling; the *Gad. æglefinus*, or haddock; the *Gad. merlangus*; the *Gad. callarius*; the *Gad. carbonarius*, or coal-fish; the *skate*, *turbot*, *soles*, &c. The recent livers of all these species of the genus Gadus, boiled in such a manner as to preserve their oil, may be used either as sauce to the fish, or may be ate with it, or the oil may be taken after the meal, in the usual medicinal way. They are beneficial both as articles of diet and as medicine. When quite recent they have no fishy or unpleasant flavour, and are easily digested, — the more easily the more oil they contain.

337. As to other articles of *diet*, *regimen*, *change of air*, *exercise*, *travelling*, *voyaging*, and *choice of residence*, the remarks which I have made above (§§ 292—308.), and in the sequel (§§ 420, 421.), and in the article CLIMATE (§§ 42. *et seq.*) are applicable to this stage, according as the strength of the patient and the prominent symptoms will admit of their adoption; and as the presence or absence of any of the more important complications will suggest.

338. *D. The treatment of the third stage of the common form of phthisis* (§§ 38. *et seq.*), is frequently but little different from that already advised. The state of the patient may not, in some instances, be materially different from that characterising the second stage, although cavities — one or more — have already formed in one or even both lungs. The patient may not be materially worse in respect either of strength or degree of emaciation, or of cough and respiration, especially if the more aggravated symptoms and complications have not as yet been experienced. More commonly, however, he is much worse as regards all these; and colliquative perspirations, attacks of diarrhœa, severe paroxysms of cough and of oppressed breathing, and pains in various parts of the chest or its vicinity from inflammatory congestion of portions of the lungs or from the extension of the morbid action to the pleura, are more or less experienced, and are generally relieved with greater difficulty than in the preceding stages. The treatment depends chiefly upon the complication, or rather complications, which characterise this stage.

339. *a*. In all cases there is more or less *bronchitis*, chiefly, however, of the bronchi communicating with the softened tubercles and cavities; but there may be in addition *inflammatory*, or *sub-inflammatory action* in the surrounding portions of lungs, or even also in parts of the pleura in the vicinity. These may require, or at least suggest, a treatment which neither the strength nor vascular condition of the patient may well bear, especially when carried so far as to subdue the super-induced local mischief. But to leave these complications to their natural courses, when clearly manifested by symptoms, may be more injurious than the effects of judicious means prescribed for their removal; and, as far as my experience enables me to decide, the employment of such means is the safest alternative. For these states of this stage, therefore, local depletions, by leeches or by cupping, are required according to the condition of the patient and symptoms of the case, the quantity of blood taken at first being small. When the indications for having recourse to this measure are doubtful, dry-cupping, afterwards blisters, the terebinthinate embrocations already advised (§ 321.), and the febrifuge medicines recommended above, are most appropriate. Of this class of medicines, the solution of acetate of ammonia, in forms and combinations already noticed (§ 315.), is the most generally of service.

340. *b*. In this stage, especially in its advanced course, the colliquative perspirations and diarrhœa exhaust the patient and more or less waste the red globules of the blood. Whilst these symptoms should be restrained, the powers of life and the supply of duly assimilated blood-globules must be supported and promoted. The means which fulfil the one indication often also aid the other. This is more particularly demonstrated by the effects of cod-liver oil, and by medicines which improve the digestive and assimilating processes, and correct, counteract, or remove the contaminating matters which are carried into the circulation from the lesions seated in the lungs, whether softened tubercles or ulcerating cavities, and which thereby affect the cutaneous and mucous surfaces and follicles, so as to give rise to these exhausting and distressing symptoms of the malady. Numerous means, beside those already mentioned, have been proposed for these morbid conditions, especially the acetate of lead with pyroligneous acid and laudanum, the sulphate of zinc with sulphuric acid, the sulphate of copper with opium, the substances containing tannin, gallic acid, &c., and catechu, kino, krameria, hæmatolylum, nux vomica, &c.; but very few of these, even while they restrain the diarrhœa, diminish the perspirations, or in any other respect alleviate the malady. Indeed, in some cases they aggravate the disease, and only accelerate its progress to a fatal issue by preventing the elimination by those emunctories of the effete, morbid, and contaminating materials conveyed into and circulating in the blood.

341. *c*. Much more rational and efficient *indications* for the abatement of the colliquative diarrhœa and perspirations in phthisis would be the improvement of the digestive and assimilating functions by such means, or combinations of means, as would at the same time, by their partial absorption into the circulation, correct, change, or counteract the contaminating matters which are imbibed from the seat of the disease; whether these matters be purulent or tubercular, or the sanious fluid formed in or on the surface of ulcerating parts, and whether they are actually present in the blood or are more or less changed

in the course of the circulation of the blood. That they actually contaminate more or less this fluid, however small may be the quantity which passes into it, and thereby give rise to the most distressing and dangerous symptoms of phthisis, cannot be doubted, the skin and the bowels being two of the chief channels through which they, and other injurious matters they may form, are eliminated from the circulation; but the selection of the means of fulfilling these indications is much more difficult than devising them, and depends entirely upon the peculiarities of individual cases, as respects especially the progress of the disease and the states of respiration and circulation. The bicarbonate and the nitrate of potass, prescribed in tonic infusions or decoctions, with aromatic or astringent or narcotic tinctures, according to the state of the case; magnesia and sulphur, with the powder of cascarilla or of cinnamon or ginger and liquorice powder, or with other substances, as the state of the bowels will suggest; the compound iron mixture, or the aromatic mixture of iron (D. P.); the bitter or tonic infusions, with carbonate or citrate of potass or of soda and anodynes; balsams, the purified or inspissated ox-gall, with conium or with the compound soap pill and ipecacuanha, or with the purified extract of aloes, according to circumstances; and camphor, the terebinthinates, tar or tar water, conjoined with such of the foregoing medicines as the features of the case require, may severally be employed. In some instances where the colliquative state of the bowels and other symptoms indicated a contaminated state of the blood, and consecutive alteration of the mucous surface and follicles of the bowels, I have prescribed the following pills at night, or night and morning, or with the meals; the bitter vegetable tonics, with alkalies, &c., having been taken in the intervals between meals:—

No. 355. ℞ Pilulæ Ferri comp.; Pilulæ Rhei comp.; Extracti Fellis bovini; Picis liquidæ, āā. ʒss. Misce et contunde bene, dein divide massam in pilulas xxx.; quarum capiat unam ad tres pro doze.

No. 356. ℞ Extr. Fellis Bovini; Sulphuris præcipit; Picis liquidæ; Confect. aromat. in pulv., āā. ʒss.; Olei anisi, q. s. Contunde bene et divide in pilulas xxxvj. Sumat j. ad iij. pro dose.

No. 357. ℞ Magnesiæ carbon.; Sulphuris præcipit., āā. ℈ij.; Confect. aromat. in pulv. ʒss.; Creasoti ♏ viij. ad xij.; Olei anisi, et mucilag. q. s. Misce et fiant secundum artem pilulæ xxxvj. Capiat j. ad iij. bis terve in die.

342. It may be noticed that the above, both mixtures and pills, may be modified, or receive additions, so as to meet the peculiarities of the case. If irritation or pain in the bowels be experienced, small doses of the extract of opium or the soap pill with opium, may be added to either of the foregoing; and if diarrhœa, or tenesmus, or dysenteric symptoms be present, ipecacuanha in full doses may also be conjoined with these.

343. With the other distressing symptoms, to which I have directed notice, there are others for which relief is required, and although we may be unable to impart it, we should at least attempt it. The dyspnœa, difficulty of breathing, the feelings of suffocation, &c., in this stage, are sometimes distressing. In many instances the terebinthinate embrocations already mentioned (§ 321.), applied over the chest or between the shoulders, will afford some relief; and an opiate conjoined with either of the pills just prescribed, or with expectorants and antispasmodics, or the compound galbanum pill, or with stimulants and other means indicated by the state of the case, or already mentioned, will often be of service. When the dyspnœa is urgent or distressing, an emetic will be found to afford most relief. The aphthæ which, towards the close of this stage, often appear in the mouth, tongue, and throat, further increase the distress of the patient, and require the treatment advised for this condition of the mouth and throat in the articles THROAT (§§ 40. *et seq.*), and THRUSH (§§ 11. *et seq.*)

344. *d. Delirium* rarely occurs in this form of phthisis until shortly before dissolution, unless in females, when this stage of the malady is accelerated by, or occurs in the puerperal state, or in cases where the nature of the medicines or the idiosyncrasy of the patient has given rise to this symptom. Most of the narcotics and anodynes, especially henbane, conium, aconite, opium, morphia, digitalis, &c., will have the effect of inducing delirium in the advanced progress of this stage, especially in nervous and exhausted states of the patient, and when either of these substances are given in too large doses, or continued too long; or when substances which are calculated to prevent or to correct their injurious effects have not been conjoined with them. The delirium, in most instances, is slight; but it is sometimes more severe or acute, and is attended with restlessness and sleeplessness, or it approaches the character of delirium tremens. For these modifications of mental disorder, lowering means only hasten a fatal issue. If they have been occasioned by either of the medicines just mentioned, they will frequently disappear after the cause has been removed, especially if judicious means be prescribed; but, under every circumstance, the state of vascular action, especially as respects the brain and membranes, should be observed. If it be increased in these, cold-sponging the head, mustard pediluvia, &c., are required; and even when such increase is present, it will be more readily relieved by restoratives, prescribed in small and moderate doses, and their effects watched, than by opposite means. The medicines from which most relief may be expected in the delirium occurring in this period, are camphor, ammonia, the solution of the acetate of ammonia, the carbonate of ammonia, the compound spirit of ether, the spirit of nitric ether, the hydro-chloric ether, the preparations of serpentaria, of arnica, and of sumbul. These may be prescribed individually, or in combinations of two or more, or with the alkaline, saline, and restorative medicines I have mentioned as being useful when the blood is contaminated, the delirium often arising from that condition, as well as from exhausted organic, nervous, or vital influence.

345. v. TREATMENT OF THE LATENT FORM OF PHTHISIS. — This variety of the disease (§§ 77. *et seq.*) generally eludes the notice of the friends and the fears of the patient until it has advanced to a state hardly admitting of hope. If, however, the symptoms characterising it should alarm either friends or patient, if depression of spirits, impaired digestion and assimilation, or other indication of disorder lead to the procuring of medical advice and the detection of the malady in its silent and stealthy course, although no prominent or unmistakeable sign be present, the treatment which will be found most beneficial is

that which has been already advised for the *Prevention* and for the *threatened appearance* of the malady (§§ 292—298.). It is obvious, however, that the best devised means will have no beneficial effect if the causes which injured the constitution still continue to act. The physician should endeavour to ascertain what these are; and if they be such as may be removed, the necessity of making the attempt should be insisted upon, and the patient be made acquainted with the consequences of the neglect of this advice, especially when the removal of these causes depends upon himself. In most of the cases of this variety the causes are usually depressing and exhausting; and in many, as soon as the nature of the malady is suspected, the digestive and assimilating functions require restoratives, mild tonics, change of air, moderate exercise in the open air, travelling, and pleasurable occupation of the mind; the regimenal and medical treatment I have advised above (§§ 299—324.) for the first stage of the usual form of the disease being also necessary. In this latent or silent course of phthisis vascular depletions are not well sustained; and if they be at all attempted, they should be small, and their effects watched. In the great majority of cases of this form, and especially when depressing or exhausting causes have occasioned the malady, medicines of a decidedly restorative or tonic kind, attention to the digestive functions, cod-liver oil, and the other means recommended at the place referred to, should be adopted. These may arrest the disease; but if it should advance, nevertheless, and become unmistakingly developed, the treatment must necessarily be the same as I have advised for the more common form of the malady, modified as above, according to the manifestations of the advanced stages.

346. vi. PRIMARY ACUTE OR RAPID PHTHISIS. — *A.* The symptoms of the *first variety* of this form (§§ 82—84.) have been described by me as intermediate between those of congestive bronchitis on the one hand, and of congestive or nervous pneumonia on the other (§ 83.), both lungs being more or less affected. The cases which I have observed have been consecutive of measles in a scrofulous diathesis, or of delayed, suppressed, or excessive catamenia. In these bleeding seemed injurious, or was of no avail. Emetics, the solution of the acetate of ammonia, with ether or ammonia, small doses of camphor, the terebinthinate embrocation applied over the chest or between the shoulders, and blisters, were the means which appeared to be of most service. Cod-liver oil was either not retained, or was nauseated and not taken, or failed of producing any benefit. The infusion or decoction of cinchona, with nitrate of potash and bicarbonates of the alkalies, or with the solution of acetate of ammonia and various ethereal preparations, and small doses of camphor with aconite, &c., were also prescribed in different cases, or in the same cases at different periods of the disease, but with no marked advantage.

347. *B.* The *second variety*, or more strictly febrile form of acute phthisis described above (§§ 85, 86.), is often mistaken for low nervous or typhoid fever, which it closely resembles, especially in its advanced progress. In the few cases which have fallen under my observation I prescribed the remedies I have just mentioned (§ 346.); and of these, the last-mentioned, or those consisting of the preparations of cinchona with the substances stated to have been conjoined with them, the chlorate of potass, camphor, the terebinthinate embrocations, &c., appeared to be of service only in prolonging the life of the patient for a few days. The nature of these cases precludes any hope of further advantage than this from any treatment whatever.

348. vii. CONSECUTIVELY ACUTE PHTHISIS (§ 87.) is merely the supervention of either of the acute varieties of the disease described above (§§ 81—86.) upon the latent form (§§ 77—80.), or the development of this latter form owing to an attack of hæmoptysis in its course, or to some determining or aggravating cause or occurrence. Although an attack of hæmoptysis often relieves the pulmonary symptoms when they have been unequivocally manifested previously, at least for a time; yet it is sometimes followed by an acute state of the disease, most frequently by the more common form, when it occurs in the course of the latent variety. In the consecutive manifestation of acute symptoms the treatment should depend upon the character of these symptoms and upon the associations they present. If hæmoptysis take place, the treatment I have advised for it (§§ 353—5.) may be adopted as far as it may be appropriate to the peculiarities of the case. If the local symptoms and signs indicate congestion or inflammatory action in one or both lungs, local vascular depletions, or even a repetition of them, emetic, antiphlogistic, and saline medicines, especially the solution of the acetate of ammonia, terebinthinate embrocations, blisters, and other means already noticed, will be of service; and if the disease assume the acute or febrile states, the medicines noticed above (§§ 346, 347.) may be prescribed, although with little or no hope of benefit from them. In some instances the malady assumes a less acute or febrile form, the treatment having temporarily mitigated the severity of the symptoms. This is probably owing to the congestive and inflammatory states of the bronchi and substance of the lungs, which had supervened upon an extensive but latent formation of tubercles in both lungs having been partially subdued by the means employed. In these cases the development of the tubercles by the morbid action in the bronchi and substance of the lungs afterwards prevents this action in these parts to subside; and thus both these morbid conditions act and react on each other, so as to occasion an acute state of disease. The extension of these lesions in a more or less marked degree through both lungs generally terminate fatally before large cavities, or even any cavities, are formed; whereas, in the common form of the disease, the greatest part of the lungs remains free from change, although other portions are ulcerated, excavated, or otherwise disorganised. In these circumstances the principles of treatment already developed should be adapted to the peculiarities of individual cases.

349. viii. PROTRACTED PHTHISIS (§§ 89—91.), especially when early recognised or manifested, and judiciously treated, furnishes many chances either of recovery or of prolonged existence. For this variety, particularly when the pulse and respiration are not much disturbed, the several hygienic means advised for the *prevention* of

LARYNX AND TRACHEA (§§ 105. *et seq.*). Since this article was written, the diseases of these parts have been ably investigated by Dr. HORACE GREEN. He contends that inflammatory affections of the larynx, trachea, and throat are seated in the mucous follicles. It is, however, chiefly in the sub-acute and chronic affections of these parts, that the follicles are either primarily or consecutively implicated, and especially when these affections are complications of phthisis, and are produced either by the protracted irritation of the trachea, larynx, epiglottis, and even of the pharynx and fauces, by cough, and by morbid secretions passing through them, or by the existence of tuberculous matter in their follicles or muciparous glands. At first, these sources of irritation and contamination enlarge these follicles, increase their discharge, thicken and somewhat soften the mucous and sub-mucous tissues, and ultimately occasion an ulceration of the mucous follicles, and an atrophy, with increased softening, of the mucous and sub-mucous membranes. That the affection of the muciparous glands, in the advanced course of phthisis, is occasioned not only by the morbid secretions passing over them, but also by the deposit of tuberculous matter in them, is extremely probable. Dr. H. GREEN insists upon this latter change, although it is denied by several eminent pathologists. In either case, the treatment cannot materially differ. Dr. H. G. found this complication of phthisis most frequent between the ages of 25 and 38 years. He also often observed this affection of the throat and larynx after influenza, eruptive fevers, and more particularly in persons habitually using tobacco. Dr. GELLERSTEDT considers the ulcerations so commonly found in the larynx, in phthisis, to be of tubercular origin; while those of the trachea he regards, with LOUIS, as of an aphthous nature, arising from the constant irritation of the cough and expectoration.

360. The *treatment* of this complication of phthisis has been by inhalation, insufflation, lotions, and the application of the solid nitrate of silver to the tonsils, uvula, and pharynx. Dr. Laycock remarks, in an able article in the *British and Foreign Medical Review* (vol. xxiv. p. 497.), that the application of the nitrate of silver to the cavity of the larynx is not, however, to be classed among these ordinary methods; and the practice of it by Dr. GREEN seems to have been received with so much incredulity in the United States, that he has thought it necessary to multiply evidence as to the fact that he has introduced a strong solution of nitrate of silver within that cavity. "TROUSSEAU and BELLOC are supposed, by Dr. GREEN, to have been the first to prescribe and employ topical medication in chronic laryngeal disease. They found a solution of the nitrate of silver, in the proportion of two drachms, or sometimes four drachms, to an ounce of distilled water, to be the most efficacious and harmless application. Two methods were adopted by them: the one was to saturate a small sponge attached to a bent rod of whalebone, and to manipulate so that the solution be expressed into the larynx: the other was to use a small silver syringe, with a tube suitably adapted for effecting the same object. Dr. GREEN, however, several years before the appearance of Messrs. TROUSSEAU and BELLOC's book, had instituted experiments, and come to a similar conclusion." Dr. LAYCOCK further remarks that, without wishing to disparage the labours of our Gallic or American brethren, Sir CHARLES BELL successfully adopted the method of treatment so fully illustrated by Dr. GREEN; and Dr. L. refers to cases published by Sir C. BELL (*Surgical Observations*, &c. Lond. 1816, p. 34.), for which this practice was employed. Dr. WATSON states that Sir C. BELL had recourse to this local application of the strong caustic solution in a case under his care; and remarks in his Lectures as follows, on the practice:—"It is said that a little practice will enable a person to pass his finger into a patient's throat, and to familiarise his sense of touch with the ordinary condition of the upper part of the respiratory apparatus, so as to be able to detect swelling, or irregularity, or thickening about the chink of the glottis. And great advantage is said to have been obtained from applying remedies directly to the diseased or irritable part. This practice was much followed by the late Mr. VANCE, who had been for many years a naval surgeon; and he called it, in naval phrase, *swabbing* the affected organ."

361. Where the laryngeal complication occurs in the advanced course of phthisis, this practice can prove only of temporary benefit. I have been consulted in many cases of this description where it had been said to have been resorted to, but apparently either with no advantage, or with very temporary relief. However, in idiopathic or primary cases, or when the complication occurs in an early stage of phthisis, for which a rational and an appropriate treatment is prescribed, this local medication of the laryngeal complication may be employed, by one capable of performing it, safely and satisfactorily. I do not, however, believe that the appliances here advised enter the larynx and trachea once in twenty times; whatever benefit results arises from the applications to the under surface of the epiglottis and adjoining parts. I have, since the commencement of my practice, trusted much in those cases to the inhalation of the weak vapour of turpentine arising from the application of the embrocation so often mentioned, either around the throat and neck, or to the chest, or between the scapulæ.

362. D. *The Abdominal Complications* of phthisis have been already partly considered, when remarking upon the treatment of the diarrhœa (§ 328.) and of the impaired digestion and assimilation (§ 234.) so generally observed previously to, and in the course of the malady. But the functions of the liver are also not sufficiently discharged in the course of the disease; and due attention has not hitherto been directed to them. That this organ has been long disordered in cases of phthisis is shown by the nature of the organic lesions it generally presents after death (§ 118.). It has been insisted upon by an able and close observer of the causes and nature of disease (Dr. McCORMAC, of Belfast), that phthisis is not only caused, but is also perpetuated, by an imperfect supply, and an insufficient digestion and assimilation of pure air in and by the lungs; consequently, the red globules of the blood are not oxygenated and assimilated to such an extent or amount as to supply the requisite materials by their waste for the elaboration of healthy bile: owing also to this cause, the carbonaceous and hydrogenous elements are not sufficiently combined with the

oxygen of the respired air, so as to contribute to healthy assimilation and nutrition; and they consequently, under the influence of life, form morbid or adventitious products, and give rise to the fatty enlargement of the liver so generally found after death (§§ 118.).

363. The great importance of promoting the digestive and assimilating processes from the very commencement of phthisis, whatever other means of treatment be adopted, will appear from what has been advanced above; and I know of no surer means of attaining this end, than by improving the secretions and excretions by suitable medicines and food, and by removing the patient to a high, dry, and temperate air, where he may enjoy the advantages of sunshine and exercise, and avoid those causes which reduce organic nervous or vital power. In general physicians have been during the last half century, in which such wonderful advances have been made in the practical sciences, so much occupied in listening to sounds which they often could neither interpret nor refer to their proper sources — in splitting the diagnostic hairs floating before their troubled, if not always dazzled vision, and in hearing what they believed even when not believing what they heard —as to be carried along by the pathology in fashion, neglecting those great views of physiological pathology which alone furnish the true basis of rational and successful practice. Whilst a murmur, a bruit, a râle, a ronchus, and every sound for which a term could be coined, and their various grades, cadences, &c., were observed, or were feigned to be observed, and were noted, and paraded and admired, on all occasions, the conditions of the vital powers and functions, upon which both disease and recovery from disease mainly depend, were entirely neglected. But attention to these latter, to the states of the secretions and excretions, to the manifestations of impaired vital power, to the causes of this impairment, to the removal of those causes, and to the true means of restoring lost energy, as regarded a malady the most fatal, the most prevalent, and the most constant in its prevalence, was practically discarded; and fussy manipulations, striking examinations, — where such examinations and manipulations were often unnecessary— were paraded in the place of these, and of other more profound, more physiological, and more practical investigations.

364. *E.* Several *other complications*, of less frequent occurrence than the above, have been mentioned (§§ 119—123.); but the means appropriate to each will readily suggest themselves to the physician. *Œdema* of the lower extremities (§ 120.) not unfrequently occurs in the advanced stages of phthisis, and is sometimes diminished by prescribing small doses of biborate of soda, or of potash, with the tonic infusions or the diuretics, or with the means employed for the disease. Pressure on the course of the veins of the lower extremities, by the sitting or other posture of the body, sometimes favours the œdema, and even occasions a permanent obstruction of these vessels.

365. xii. BRIEF REMARKS ON SOME OF THE MEANS ADVISED FOR TUBERCULAR PHTHISIS. — Having considered the treatment which appears the most suited to the several forms and stages of phthisis, I am next desirous to notice the medicines which have been recommended by writers for this disease, and to mention the circumstances or states of the malady in which they may be prescribed, and in which they are contra-indicated. Most of these medicines have been prescribed empirically in phthisis; for, although the treatment of the disease had assumed a rational aspect in the works of our countrymen BENNET and MORTON, there were few besides, even among the most eminent of medical writers, who presented us with a plan of cure which was even tolerably appropriate to the stages and states of the disease; and, even amongst those who had cultivated the most the diagnosis and pathology of this malady, there were very few who recommended their favourite remedies with due reference to the states and complications of the disease, and to the pathological conditions which they had themselves described or admitted. I shall, therefore, attempt to inquire, in my brief notices of the substances recommended, into the circumstances in which either experience or the operation of these substances warrants their use.

366. *Acids.* Most of the *mineral and vegetable acids* have been employed in phthisis, but seldom with any definite object, or to fulfil a rational indication. The chief intention with which they have been prescribed in recent times is to repress or prevent hæmoptysis, or to act as a refrigerant when the febrile action is considerable, and the night-sweats exhausting. They are merely palliatives—and in this they often fail, and sometimes they even render the cough harder and more severe; and, with the exceptions of the hydrocyanic and boracic, they are injurious to the sub-inflammatory states, and in the inflammatory complications of the disease.—The *acetic acid* has long been employed in phthisis; and when the contra-indications just mentioned do not prevent recourse to it, either simply or in the form of raspberry-vinegar, or oxymel more or less diluted, it is a grateful and cooling medicine, especially after hæmoptysis has been considerable or excessive. In states of great exhaustion, or colliquation, when it is desirable to produce an antiseptic as well as an astringent effect, the pyroligneous acetic acid may be given, or even a drop of the aromatic.

367. *Sulphuric acid*, much diluted, has been commonly prescribed in phthisis, and generally with the same object as the acetic. BANG gave it with mucilages; JOERDENS with the Phellandrium aquaticum, a medicine much employed in Germany for this disease, and PORTAL in states of weak dilution, as a cooling drink; ROLLO and HUFELAND considered it useless; but COLLBATCH, GRANT, DE HAEN, HOME, FOTHERGILL, SIMMONS, SIMS, and MARX, entertained a more favourable opinion of it, especially in the form of acidum sulphuricum aromaticum, or *vitriolic elixir.* QUARIN very justly cautions against its use in the more inflammatory states and complications of the disease.—Weak dilutions of the *nitric* and the *hydro-chloric* acids may be prescribed, in the same states as those which admit of the use of the foregoing; and the combination of the two—one part of the former to two of the latter—when the contra-indications mentioned above are not present; and, when exhaustion, colliquation, and other symptoms of vital depression are urgent, these two may be added to the infusion of cinchona, or other restoratives, especially when the functions of th
are much impaired. I have prescribed th

benefit in such cases, and sometimes given the cod-liver oil on the surface of a mixture of these or of similar substances.

368. *Hydrocyanic acid* is one of the most useful medicines in this disease. It was introduced into practice by MAGENDIE, GRANVILLE, and ELLIOTSON, who took a just view of its effects both in phthisis and in dyspepsia—complaints so intimately allied in their origins and in their pathology, as already shown. Its influence in the latter benefits the former, whilst it exerts a soothing effect on the cough, without aggravating, but rather ameliorating, any complication which may appear in the course of the malady. It may, moreover, be advantageously conjoined with other acids, with the neutral salines, most of which it is incapable of decomposing, and with the great majority of other medicines usually prescribed for phthisis. Of the other acids, the most important are the *citric*, the *benzoic*, and the *boracic*. The *citric* is serviceable in the states of the disease for which the acetic is given; but, either in the pure form or as it exists in lemon juice, it is most useful as an adjunct to beverages, or in combination with the alkalies. In these latter states it aids, with other means, in preventing, counteracting, or removing the morbid conditions of the circulating fluids in the advanced stages of phthisis. *Benzoic acid* has been frequently advised in various combinations for this disease, but has rarely been confided in alone. It is chiefly in the more asthenic and colliquative conditions that it is at all of service. I have seen more benefit from the *boracic*, than from benzoic acid. Either of these acids may be given conjoined with mucilaginous, balsamic, and expectorant medicines, when these are indicated. The boracic acid and its alkaline salts — the biborate of soda and B. of potash — are not contra-indicated by the inflammatory diathesis, and may be given in those states in which the mineral acids are inappropriate. I have found the *dilute phosphoric acid* of much service in the few cases in which I have tried it. It may be prescribed in doses of 20 to 40 minims in cases of phthisis characterised by vital depression or exhaustion, especially when the disease appeared to result from depressing causes, or from masturbation. For such, it may be given in the infusion of absinthium, or of ginseng root, with or without the addition of the tincture of sumbul.

369. *Aconite* was first prescribed for phthisis by PORTAL, who afterwards relinquished the use of it. BUSCH gave the powder of the dried leaves in doses of two grains every two or three hours, and increased the dose until a drachm was taken in the twenty-four hours. I have prescribed the powder in smaller doses in a few cases; and the extract in doses of a quarter of a grain, in others, cautiously increasing the dose; but I have ventured upon it only in the more inflammatory states as a substitute for bleeding. I cannot say that it was so beneficial as BUSCH and HAREL DU TANEREL have stated it to have been. It had, however, the effect of lowering the pulse, of causing perspiration, of diminishing pain, and of affording ease; and, although I cannot view it, with the writers just mentioned, as a cure for phthisis, yet I consider it as an excellent medicine in the more inflammatory states and complications of the disease, when prudently exhibited, or when its doses are increased, or its use interrupted and resumed from time to time, as circumstances require.

370. *Alkalies and alkaline salts* are serviceable in several states of phthisis. The former, and their sub-carbonates, were much praised by BARKER and SPALDING. I have often prescribed the liquor potassæ, and BRANDISH's alkaline solution in the scrofulous forms of the disease, with sarsaparilla, demulcents, and narcotics, and, in the protracted form, with tonics or bitters and anodynes, with temporary, and sometimes with permanent benefit. In certain states, and more particularly when the blood is probably more or less contaminated by the passage into it of morbid matters from the lungs, the alkalies are often advantageous combined with the solutions of the neutral salts, as the bi-carbonate of potass, with the nitrate, or the solution of the acetate with the carbonate of ammonia, and with the other substances now mentioned.

371. *Ammoniacum* was frequently prescribed in phthisis, and often injudiciously, especially in combination with squills or other heating gum-resins. It should be given only in the more chronic states of the disease, and even in these with caution, and rarely with the medicines now mentioned. I have prescribed it with benefit when an expectorant was required, and when no inflammatory complication existed; but if the cough became severe or hard during its use, it was always relinquished. I generally gave it as follows: —

No. 359. ℞. Ammoniaci ʒjss. tere cum Aq. Destill. ℥ivss.; dein adde Vini Antimonialis ʒij.; Liq. Ammoniæ acetatis ℥ij.; Tinct. Conii (vel Tinct. Hyoscyami) ʒij.; Syrupi Althææ officinalis ad ℥viij., misce. Sit mistura, cujus capiat cochl. j. vel ij. larga, 4tis vel 6tis horis.

No. 360. ℞. Ammoniaci ʒjss.; Tinct. Benzoini Comp. ʒiij.; Tinct. Camphoræ Comp. ʒss.; Aquæ Flor. Aurantii, Aq. Sambuci, āā, ℥iij.; Tere bene. et adde Tinct. Conii ʒjss., Acidi Hydrocyanici diluti ʒss., Syrupi Tolutani ʒij., Syrupi Althææ officinalis ad ℥viij. Misce. Capiat cochl. j. amplum, 3tis vel 4tis horis.

No. 361. ℞. Ammoniaci, Balsami Sulphuris Anisati (*vide* § 400.), āā. ʒj.; Extr. Hyoscyami (vel Conii), ℈ij.; Saponis Castil. ʒss.; Extr. Glycyrrh. ʒss. Misce. Fiant, secundum artem, Pilulæ L. quarum capiat unam vel duas, omni 4ta vel 6ta horâ.

No. 362. ℞. Ammoniaci, Galbani, Extr. Conii, Saponis Castil. āā. ʒss.; Fol. Belladonnæ gr. xv.; Antimonii Potassio-tart. gr. v. Contunde bene. et fiant secundum artem Pilulæ xxxvj. Sumantur binæ vel tres ter in die. (The Pills prescribed by RICHTER, (*op. cit.*) for tubercular phthisis).

372. *Balsams* have been long in use in chronic pectoral diseases, and especially in phthisis; and although they are sometimes of service, they are as often injurious, unless they be given with great discrimination. Under this denomination the *Copaiba*, the *Peruvian*, and the *tolu balsam* fall more strictly; the others more correctly belong to the terebinthinates and to the gum-resins, and to these likewise the older writers often extended the term. The circumstances, and the combinations in which the balsams, and even the other substances often ranked in the same category, may be prescribed in phthisis, are the same as those which I have stated in respect of the exhibition of ammoniacum (§ 371.). When it is considered that these medicines, and those closely allied to them, are appropriate only in certain states of the malady, that an empirical use of them may be as often injurious as beneficial, we should not be surprised at finding them recommended by DE HAEN, GODBOLD, SIMMONS, RUSH, &c.; and de-

nounced by Fothergill, Frize, and others. The Copaiba balsam was preferred by Fuller, Hoffmann, Monro, and Gesner; but it is now seldom prescribed for phthisis. A substance becomes a remedy only by its appropriate use.—*Barytes, the hydrochlorate*, has been recommended in phthisis by Hufeland, Herz, and Crawford; but, although it has been prescribed by many, yet no satisfactory result has been adduced respecting it.

373. *Bitters and tonic infusions*, as those of absinthium, Gentian, Calumba, Chereita, &c., have been advised for phthisis by Cælius Aurelianus, Chalmers, Salvatori, Rush, May, and Pears, generally also with a nourishing and digestible diet. Although too generally and empirically prescribed by these and other writers, yet these medicines are often required in the usual and more chronic states of the disease, especially with the view of removing the symptoms of indigestion so frequently attending phthisis from its commencement, and of supporting the vital powers. These infusions, moreover, may be made the vehicles, in which other medicines, whether saline, anodyne, or alterative, or narcotic, may be prescribed.

374. *Camphor* was given in phthisis by Burserius; by Marx, with nitre and hydro-chlorate of ammonia; and by Kortum with this latter salt. It is useful chiefly as an adjunct to other more appropriate medicines, or when it is given with the object of abating urgent symptoms. In small doses it is beneficial, especially when conjoined with nitre, the spirits of nitric æther, and solution of the acetate of ammonia, in allaying febrile action and inflammatory complications. In larger doses, and combined with the sesquicarbonate of ammonia, it is of service in the advanced stage of phthisis, in rallying the vital power and in counteracting morbid conditions of the blood, whilst it promotes expectoration; and with the extract of conium or of henbane, or with a preparation of opium, it allays irritation, both locally and generally.

375. *Carbon or charcoal* was formerly much employed in the colliquative states of phthisis, in dysentery, and in putro-adynamic fevers. I have given it at an early period of my practice in several cases, but generally with camphor, chalk, cascarilla, and aromatics, in doses varying from a scruple to a drachm; and chiefly with the intention of correcting the fœtor of the excretions. Sobernheim states that Schoenlein gave it in phthisis with digitalis; and Garrett prescribed it with sulphur and the extract of the smaller centaury. I suspect, however, that whatever benefit resulted from these combinations cannot be imputed to the carbon. M. Jourdan justly remarks, "Lorsque les théories chimiques régnaient en Médecine, on attribuait au Charbon végétal puissantes vertus dans la phthisie pulmonaire, la dysenterie, et surtout les maladies putrides. Le temps n'a justifié aucune des espérances qu'on avait conçues à cet égard."

376. *Cascarilla* was often prescribed with the same intention as cinchona and the medicines last noticed. I have given it only in the form of infusion in the more colliquative states and non-febrile forms of phthisis, and have generally made this preparation the vehicle for such other medicines as the peculiarities of the case suggested. Cascarilla has received the approbation of Thilenius, Wendt, Kruegelstein, and Hecker, in the usual and more chronic forms of the disease, indeed, in the states for which I have prescribed it. The historical sketch I have given above, will sufficiently show the diversity of opinions as to the propriety of employing the tonic and astringent barks in phthisis; and more particularly as to the use of cinchona, &c.

377. *Chalybeates* have been already mentioned in connection with the states of the disease in which they may be prescribed. They have been recommended by Griffith, Günther, Stanger, Schaller, Velsen, and many others. The compound mixture of iron, the ammonio-citrate of iron, the ammonio-chloride of iron, the solution of the pernitrate of iron, the potassio-tartrate of iron, the tinctures of the acetate and of the muriate of iron, and the compound pills of iron, are severally of use in certain states of phthisis; but there are few medicines which require greater discrimination and caution in their use in this disease than they. Cases which proceed from depressing and exhausting causes, in which the blood is poor in red globules, or which are free from inflammatory or hæmoptysic complications, are often benefited by chalybeates, as well as by other tonics, especially if dyspeptic symptoms are prominent; but their effects upon the cough, expectoration, breathing, pulse, and the accompanying hectic, should be carefully watched; and any aggravation of these should cause the discontinuance of the medicines and the adoption of other means. The good effects of chalybeates may be aided by other medicines, with which they may be conjoined according to the stage and complications and other peculiarities of the case.

378. *Cinchona.* Whilst Desault, De Meza, and Romans considered it injurious, and Fothergill said that it was rarely of use, Quarin, Vogel, Raulin, Marx, Jaeger, Horn, Schmidtmann, and others, recommended it. Haller, Home, and Chapman, prescribed cinchona with a milk and vegetable diet. Callisen gave it with a powerful stimulant, the oil of asphaltum, of which notice will be taken hereafter; Thomann with opiates; and Ryan and May with animal food. Stoll advised cinchona, when inflammatory symptoms were absent, and Simmons when the expectoration was abundant and puriform. Metternich preferred the extract, and gave it in large doses. In more recent times, the *sulphate of quina* has been substituted for the preparations of cinchona, in phthisis as well as in other diseases; but I doubt the advantage of the substitution as respects this malady, for the infusion, the decoction, the extract, and the compound tincture of cinchona, furnished the physician with the means of selection according to the features of the case for which he was prescribing. However, the sulphate of quina is an excellent medicine, when it is desirable to have recourse at the same time to an acid and to an astringent; and then it may be given in the compound infusion of roses, and at the same time also, as advised by Guenther, Amelung, Droste, and some other German writers, with the tincture of digitalis, or with the powder of digitalis in the form of pill. I have prescribed it, with small doses of camphor and conium, with benefit in some states of the disease.

379. *Conium* has, from the days of Sto
down to the present time, been more ger

employed in phthisis and scrofula than perhaps any other medicine. It has been praised by QUARIN, ZEVIANI, FOTHERGILL, ADAIR, BUTTER, BUSCH, HUFELAND, and many others; and yet there are few medicines whose effects in phthisis are more equivocal, and, as usually employed, are more uncertain. At the present day it is seldom confided in alone; and when given as an adjunct to other means it is often in insufficient doses, or in imperfect states of preparation, and not persisted in for the time required to evince its effects.

380. *Creasote* has been recommended for phthisis by SCHROEN, REICHENBACH, CARTONI, RAMPOLD, and others. I have employed it, since its introduction to medical practice, chiefly as an adjuvant of other means in the last stage of the disease, and for the mitigation of the disorders of the stomach and bowels, — of nausea, vomiting, diarrhœa, &c. It is also of great benefit when used to slightly impregnate the air of the apartment in which the patient chiefly resides (§ 413.). Creasote, however, should not be prescribed in the circumstances contra-indicating chalybeates and tonics,—when the cough is dry, hard, or constrictive, — when a state of erythism or of active congestion is inferred, and when an inflammatory complication or active hæmoptysis is present. It is chiefly in the colliquative or asthenic conditions of phthisis, that it is a valuable adjunct of other means, and especially when the excretions are more or less fœtid, and the circulation is contaminated by the passage of morbid matters into it from the primary seat of disease.

381. *Digitalis* has been recommended by some, and praised by others, for phthisis. Indeed there is, perhaps, no other medicine which has been more generally employed in this disease, and whose operation has been less understood, than digitalis, —has, in short, been more empirically prescribed. It has been sanctioned by BEDDOES, WITHERING, DARWIN, FERRIAR, SPENCE, FOWLER, KINGLAKE, MAGENNIS. MEYER, and THOMAS. Dr. DRAKE says that citric acid counteracts its unpleasant or cumulative effects, when given in too frequent or too large doses. Whilst the above, and many continental writers, are favourable to the use of digitalis in phthisis, BREE and BAILEY contend that it is injurious in some cases and useless in others. I have, however, seen some benefit derived from the infusion, prescribed at first in very large, and afterwards in rapidly diminished doses; especially in the hæmoptysic and febrile states, and in the congestive and inflammatory complications of the disease.—*Dulcamara* was advised for phthisis by BURSERIUS, and afterwards by STARK, RICHTER, and HUFELAND, who generally gave it in conjunction with the Iceland moss.

382. *Emetics* have been recommended for phthisis since the days of HIPPOCRATES to the present time. MORTON, BRYAN-ROBINSON, MARRYAT, SIMMONS, SIMS, KENTISH, MARET, REID, METTERNICH, SWEDIAUR, PARR, RICHTER, DUMAS, &c., advise emetics at an early stage of the disease; some, as REID, BAYLE, and others, with a frequency which appears to be excessive or even injurious; others, as YOUNG, CLARK, WITT, &c., in a more moderate and rational manner. Many physicians in Italy, early in the present century, pretended to have cured phthisis by the exhibition of a solution of tartar emetic, in the infusion of the flowers of the sambucus nigra, or in other emollient infusions — generally three grains of the former in six ounces of the latter. A quantity sufficient to produce vomiting was directed night and morning, and milk and water were drank freely. If diarrhœa supervened, digitalis and ipecacuanha were prescribed in small and frequent doses, with other means calculated to moderate or arrest the diarrhœa, and the emetic tartar was relinquished.

383. Emetics are often of service, especially in the early stage of the malady, and when advised as above (§§ 306. 317.); but they should be prescribed with caution, and with strict reference to the functions of the stomach and liver, and to the assimilative and vital powers. I have already mentioned those which may be preferred; but even they ought not to be given so as to impair digestion and assimilation; and if these functions be weakened by them, or in cases where this risk appears great, mild tonics and a restorative and digestible diet, aided by external derivation, should be prescribed. In the advanced stages of phthisis, emetics are of more doubtful advantage, but even in these they may be of service. BLUMENBACH recommended them even in the third stage; but either in this, or in an earlier period, they sometimes constitute an important part of rational practice, especially if appropriately selected, when the digestive mucous surface appears to be loaded by sordes, when the expectoration is difficult or scanty, the breathing suffocative or oppressed, and the biliary secretion interrupted, or deficient in the evacuations. But even in these circumstances, vital power should not be exhausted by a too frequent recourse to them, and the digestive functions ought to be restored soon afterwards by suitable tonics and anodynes, as the infusion and tincture of calumba, or of chereita, or of other bitter tonics, with hydrocyanic acid, conium, &c.; or with one of the vegetable extracts, the purified oxgall, &c., in the form of pill.—*Ipecacuanha* is useful in phthisis not merely as an emetic but as a nauseant, expectorant, and promoter of digestion, and as a corrector of morbid actions in the bowels, according to its dose and mode of administration. As a nauseant it was praised by PIDERIT, BARBARI, and others; and it certainly is a valuable medicine in the more inflammatory and hæmoptysic states of the disease; and in the form of pill with bitter tonics and anodynes, or astringents when the bowels are much relaxed.

384. *The iodides*, especially the iodide of potass, have been employed in phthisis, but are appropriate only in the more chronic states of the disease. Since the discovery of iodine, the use of its preparations in scrofula had extended to tubercular consumption. The earlier prescribers of this substance, and of iodides generally, erred in giving them in too large doses, in scrofulous and other diseases, and in neglecting to conjoin them with a sufficient quantity of alkalies, whereby the irritating effects of the iodine, or the decomposition of the iodide, by the acids of the stomach, might be prevented. Thus, even when a very small dose of the iodide of potass is prescribed in a vehicle suited to the features of the case, the solution of potass or the bicarbonate should be given in sufficient quantity to prevent the decomposition of the iodide. Whatever form or combination of iodine is

given in phthisis, the effect upon the digestive functions, the pulse and the cough should be watched, and if it induce dyspeptic symptoms, or aggravate those already present, it should either be relinquished, or the dose of it much reduced.—*The Karageen Moss*, or Fucus crispus, has been long employed as a popular remedy in consumption, and it has been favourably noticed by M. Béral, myself, and others. It, as well as others among the fuci, may be used as a demulcent in this disease, with some benefit, probably arising in part from the minute quantity of iodine this class of sea-weed contains.

385. *The Lichen Islandicus* has been very commonly used in consumptive cases by Quarin, Bergius, Thilenius, Marx, Régnault, Richter, Schmidtman, Crichton, and others. It is one of the most generally useful medicines in this disease; its bitter, demulcent, and tonic properties, divested of exciting action, rarely proving injurious, even in the more febrile cases. Wendt, myself, and others, prescribed it with milk, adding to these such other medicines as the circumstances of the case required. Sachtleben recommended a decoction of three ounces each of the lichen, and of the polygala amara, of six drachms of liquorice root, and of three drachms of dulcamara, to be made with milk, as a preferable mode of prescribing the lichen in consumption. The decoction of these substances is best made with water to which a small quantity of the carbonate or solution of potash is added, boiled milk being added to the strained decoction, and such anodynes, or other remedies, as the peculiarities of the case suggest.

386. *Lactucarium* was much employed by Duncan, Rothammel, and François to allay the cough in phthisis and bronchitis, and was considered appropriate in the inflammatory state of the disease. It may be given under almost any circumstances with this intention, and may be conjoined with ipecacuanha, digitalis, demulcents, mild tonics or bitters, or other medicines suited to the case.

387. *Lead, the acetate of*, has been often prescribed in phthisis, but chiefly with the view of arresting hæmoptysis, and it has then been given either with opium and ipecacuanha, in the form of pill, or in solution, with the addition of acetic acid. These combinations of acetate have been advised by Kopp, Stark, Ettmuller, Amelung, Hildenbrand, Hork, and others. Weber prescribed the acetate with digitalis, myrrh, balsam of Peru, extract of hellenium, and mucilage, in the form of pills. Hoffmann preferred the phosphate of lead, in the dose of a grain, to the acetate, and conjoined it with the extract of henbane.

388. *Lime water* and the *muriate of lime* were advised by Quarin, Marx, Beddoes, and Hufeland. Effervescing lime water (*Carara-water*), is very advantageously given with milk, especially when the bowels are much relaxed. For this state of the malady not only may catechu, kino, and other means already recommended for it be employed, but the nitrate of silver, the extract of nux vomica, tar made into pills with liquorice powder, &c., also be individually tried.

389. *Mercurials* are occasionally of service in phthisis, especially in certain states of the disease; and when judiciously combined with other medicines. Mercury with chalk, the blue pill, or Plümmer's pill, will be of service, when the biliary functions are torpid, either alone or with soap and taraxacum, or with the compound rhubarb pill, or with the aloes and myrrh pill, when the digestive functions require to be assisted. In the more inflammatory states or complications of the disease calomel may be prescribed, as advised by Beddoes; although it should not be pushed so far as to produce salivation, as recommended by Rush, unless the disease be consequent upon syphilis; when the very unfavourable state of the malady may require this decided treatment. When partial pneumonitis, or pleuritis, or pneumo-pleuritis complicate phthisis, then calomel may be employed; and be beneficially conjoined with antimonials, or with ipecacuanha, or with opium, or with other narcotics. The beneficial effects of the bichloride of mercury, prescribed in the decoction, or in either of the tinctures of cinchona, in scrofulous cases, have induced me, as well as other physicians, to employ the same combination in the more manifestly scrofulous states of phthisis; and in some instances with much benefit; but, in my own cases, as other means were also employed, especially the external treatment about to be noticed, the amount of benefit derived from the former could hardly be determined. Schaeffer and Valentin have also given the bichloride with tonics and opium in phthisis, and, as they conceived, with advantage.

390. *Myrrh* and various gum-resins, especially *asafœtida*, *galbanum*, *&c.*, are most appropriate in the more chronic or protracted forms of phthisis, when they are attended by dyspnœa or difficult expectoration, and in females when the catamenia are difficult or scanty; or when the disease has been caused by depressing or exhausting causes. They are contra-indicated during inflammatory states and complications, and in the febrile forms of the malady: and are best suited to the circumstances of the disease which admit of chalybeates, tonics, balsams, cinchona, &c. In the form of Griffith's mixture (§§ 314. 377.), or when conjoined, as in the compound galbanum, or compound iron pill, or when further combined as with soap, extract of conium, or extract of henbane, they are sometimes of service.

391. *The oils*, especially *fish oils*, have only recently been employed in consumptive diseases, although they have been long previously used in other disorders. Hankel appears to have been the first to prescribe the *cod-liver oil* in phthisis in Germany, and Professor Bennett in Edinburgh, to whom the credit of having first recommended it is clearly due. Contemporary with the earliest employment of it in this country, it was prescribed for a lady, whom I frequently saw in consultation with my friend Dr. Baird; and at that time it was not to be had in London, Mr. Morson having procured it, at our request, from the Continent. Since then I have employed it in this and several other diseases; and have always seen more or less benefit derived from it, especially in the more usual, and in the protracted, states of phthisis. It may be given in various ways; but generally with greatest benefit, from an hour to two hours after a meal, in the dose of half an ounce or even more for an adult, on the surface of any agreeable vehicle, — as of an infusion of orange peel, or of any bitter tonic or aromatic infusion,

either a little acid or carbonate or citrate of an alkali, and any anodyne, &c.; or on the surface of milk, or of ginger or orange wine, &c. This oil may be taken twice or thrice daily, and in all stages of the disease. After continuing it for some days or weeks, it may be intermitted for a few days, and medical treatment may then be directed more especially to the digestive functions, and to the promotion of the biliary and intestinal secretions and excretions; and after such intermission, its use should be resumed and continued for a time which the state of the case and its effects will indicate.

392. All the *fish oils*, especially the oils from the livers of the *Torsk*, *Cod*, and other fish which I have enumerated above (§ 336.) are beneficial in phthisis, especially when they are recent, or fresh, and then they may be taken in larger quantity. The common use of fish oils in the most northerly countries of Europe probably is partly the cause of the infrequency of phthisis in those countries. The use of vegetable oils, especially *olive oil*, in countries near the Mediterranean, and in the north of Africa, may have the effect of diminishing the number of phthisical cases in those countries; and the adoption of the *palm oil nut*, as an article of food, in Western Africa, and of the oil for daily inunction of the surface of the body, may have a similar effect on the natives of that part of the world. It is not unlikely that other mild vegetable oils, as *linseed*, *almond*, &c., may also prove of service when taken in sufficient quantity and when judiciously conjoined with other medicines. Formerly the *oil of asphaltum* or of bitumen was often prescribed for phthisis, especially by Callisen, Bang, Thilenius, Healde, and others. Quarin said that it was only slightly palliative, whilst Frize considered it injurious. It was probably employed then, as other things have been used recently, or are praised now, merely with the object of being, with their abettors, talked of.

393. *Opium* and *Opiates*, in various forms, have been advised in phthisis by many writers, and condemned by others. There are, however, states of the disease which indicate the propriety of having recourse to them, and circumstances which contra-indicate their use. They are more frequently injurious than beneficial in the first stage of the disease, although Tralles has given a different opinion. Sometimes in the second stage, but most frequently in the third stage, opiates, or even the preparations of morphia, are of great service; but much of the benefit produced by them will depend upon the combinations in which they are prescribed. Marcus gave them with myrrh and Peruvian balsam, and, in the advanced and more chronic states of phthisis, this combination, or that with the compound galbanum pill, and the compound soap pill, will be appropriate. Peart advised opiates to be given with the carbonate of ammonia, æther, and aloes; and J. Frank laudanum, with the aromatic sulphuric acid. In the third stage of the disease, preparations containing more or less opium, especially the compound tincture of camphor, the compound styrax pill, pills of ipecacuanha and opium, &c.; and, when diarrhœa is present, the opiated cretaceous powder, the compound cretaceous powder with opium, the compound ipecacuanha powder, the compound kino powder, or the combination of opium with the extract of nux vomica, or with the nitrate of silver, or with the sulphate of copper, or with the sulphate of zinc, will be found individually of service, when judiciously prescribed. When there is much debility, opiates should not be given in full doses, unless they be combined with aromatics, tonics, or stimulants, or with balsams or gum resins; and when the preparations of morphia are preferred to other opiates, then this recommendation should be especially kept in recollection, because I have seen much distress result from its neglect.

394. *The Phillandrium aquaticum*, or water hemlock, especially the seeds and herb, has been much recommended for phthisis by Stern, Oswald, Fischer, J. Frank, Ricamier, Rosenmüller, Henning, Michaelis, &c., who have employed chiefly the powder of the seeds, in doses of ten to twenty grains, the decoction and tincture. Its action is stimulant, narcotic, and diuretic. Some of the authorities now adduced have given this medicine with sulphur. Lange prescribed it, after bleeding, in robust or plethoric cases, in goats' milk twice or thrice daily; Herz, with nitrate of potass, sugar of milk, and gum Arabic, thrice daily; and Hufeland, Müller, Chiappa, Remer, Berkun, and Heine, in various forms and combinations, — in powder, decoction, and tincture.

395. *The Polygala amara* has been much praised in phthisis by Thilenius, Plenciz, Collin, Baume, Frize, &c., and is certainly to be preferred to the *polygala senega*, in this disease, as it is more tonic and pectoral than this latter. It was formerly much employed in consumptive diseases; but has now fallen into undeserved neglect. The root is chiefly used; and either in powder (from fifteen to thirty grains), or in extract, or infusion, or decoction, in which forms it is directed in several of the Continental pharmacopœias. The *Polygala Senega* is much more stimulating than the P. amara, and is not appropriate in the more inflammatory and complicated states of phthisis, unless it be given with ipecacuanha, or with antimonials, so as to occasion nausea or vomiting. The decoction is, however, sometimes of use, not only when prescribed with this intention, but also in the less febrile and more chronic forms, or in the advanced stages, when it is desirable to promote expectoration, or to relieve dyspnœa; and in these circumstances it may be conjoined with orange-flower water, or with hydrocyanic acid, or conium, or the compound tincture of camphor, or with other anodynes, as the peculiarities of the case will suggest.

396. *Salix, &c.* — Besides the barks already mentioned (§§ 376. 378.) others, especially the *willow*, the *cedar*, the *larch*, and *fir-barks* have also been employed in phthisis, but they are useful chiefly as tonics and astringents, and have few other virtues to recommend them. Gourraud and Schneider prescribed an extract of the middle bark of the *willow* in this disease; and the *cedar* and *pomegranate* barks were prescribed not merely as tonic in phthisis, but also with the object of destroying intestinal worms, with which this disease was sometimes complicated, especially in low, cold, and damp localities.

397. *Sage* is an old and popular remedy for coughs and colds: it was also much used in pulmonary consumption. It is by no means a

bad adjunct to other medicines, and may be advantageously combined with the decoction of *marsh mallows*, in which form it was prescribed by Quarin and others.

398. *Salts and Saline Solutions* of various kinds have been prescribed for phthisis, with the intention of moderating the hectic and other symptoms, rather than with hopes of curing the disease, although several of them may be as rationally considered capable of effecting this latter object as many other medicines which have been employed with this expectation. Of this class of substances none are more generally useful than the solution of the acetate of ammonia, and of the citrates of the fixed alkalies, of ammonia, and of magnesia. The solution of *acetate of ammonia* is of service chiefly in the early stage of phthisis, and may be prescribed, according to the state of the case, with the nitrate of potash, sweet spirits of nitre, and camphor mixture, with hydrocyanic acid, or with compound camphor mixture, or with conium, henbane, &c. In more advanced or chronic states the ammonia of the acetate may be given in excess, and other medicines substituted for some of those now mentioned. The *citrates of potass*, of *soda*, and of *magnesia*, are of service, either individually, or with the nitrate of potass, and the other substances enumerated, chiefly in advanced stages of the disease, when the blood becomes contaminated by the absorption of morbid materials. In similar states of phthisis the *carbonates of the alkalies* are also of service, especially when given with the *nitrate of potash*, or with the *chlorate of potash*, in solution or in vehicles — bitter, tonic, or demulcent — suitable to the requirements of particular cases. The *hydrochlorate of ammonia* was much employed by Thilenius and Marx in phthisis, as well as in all forms of hectic and in some other fevers, periodic and continued; and was a favourite remedy in these diseases among German physicians early in the present century.

399. The *secale cornutum* has been found very efficacious in arresting the hæmorrhage, in the hæmoptysic states of phthisis. Dr. T——, who had been for many years subject to attacks of hæmoptysis, had recourse, and generally with success, to the secale, in doses of five grains, at intervals of a few minutes, until the discharge began to cease. It was not until at an advanced period of life, and when travelling on the railway, that he was disappointed in the effects of this remedy, for he always carried it on his person. I saw him on his arrival in town, and prescribed oil of turpentine. The hæmorrhage returned some time afterwards, and produced suffocation. I had an opportunity of examining the lungs. The appearances are noticed in another place (§ 91.). The hæmorrhage proceeded from ulcerated vessels.

400. *Sulphur* was formerly much employed in phthisis, and was prescribed either in combination with myrrh and various balsams, gum resins, or powders, or in the form of a balsam or electuary, prepared with an essential oil, as the oil of aniseed, or with honey or syrup, and given with such other medicines — demulcent, emollient, anodyne, absorbent, or narcotic — as the state of the case suggested. The anisated balsam of sulphur especially, and other combinations of this substance, were strongly recommended by Ettmuller, Busch, Sims, Agricola, Rollo, and others. Hunold prescribed it with charcoal in the advanced stage of the disease. The *anisated balsam of sulphur*, the preparation most frequently used, consisted of one part of the flower of sulphur, and four parts of the oil of aniseed, which were digested in a sand-bath. If diarrhœa was present, the sulphur was given with preparations of chalk, or with astringents and tonics. Sulphur has long since fallen into disuse in phthisis; but I have seen much benefit from it in several states of the disease, when judiciously combined and prescribed.

401. *Tartar emetic* was prescribed by Schlegel in small and frequent doses, and was probably employed by him and others on account of the apparent benefit derived from it and other antimonials in the inflammatory complications of the disease. The contra-stimulant doctrine in vogue in Italy at the end of the last century, and in France at the commencement of this, carried the use of tartar emetic in diseases of excited action to an extravagant height; and, very probably, more injury than advantage was derived from it, owing to its improper use. However, in the more inflammatory, and in the more active hæmorrhagic, states of the malady, it is often of service when given either as an emetic, or in frequent small doses, as a contra-stimulant.

402. *Tussilago Farfara* has been for ages a popular remedy for chronic coughs and consumptions; and the several parts of the plant have been used in the form of infusion, decoction, electuaries, syrups, &c. for these complaints. It was recommended for phthisis by Percival, Reusner, Kramer, and others; and the mucilaginous, bitter, and mildly tonic virtues of the plant appear to warrant their recommendation.

403. *Turpentine*, in the various modes of its existence, from the essential oil through the terebinthinate balsams to the pine-tops, tar, and tar-water, have been for ages found of benefit in various states of phthisis, some in certain states, and others in other states. These substances, in their several modes of employment, are often of service, not only when exhibited internally, but also when employed externally, and when the much diluted vapour, or even the odour from them, is inhaled into the lungs. In the hæmoptysic states of phthisis, when it is proper to arrest the hæmorrhage, there is no remedy that is more certainly efficacious than turpentine, when exhibited in small and frequently repeated doses, epithems of the same substance being applied over the chest. It may be taken in doses varying from twenty minims to a drachm every hour, or two or three hours, according to the urgency of the case; or even oftener, either mixed in honey and liquorice powder, as prescribed by Gasser and myself, and as advised in a memoir on the use of this medicine, published in 1820 in the London Medical and Physical Journal; or as directed in a case lately attended by Mr. W. Barnwell and myself.

No. 363. ℞. Olei Terebinthinæ ʒiss.; Spirit. Ætheris Sulphurici Comp. ʒij.; Pulv. Tragacanth. Comp. ʒijss.; Mist. Camphoræ ℥ij.; Syrupi Rosæ et Syrupi Tolutani, āā, ʒjss.; Aquæ destillatæ ad ℥vj. Misce. Fiat mistura, cujus sumatur pars quarta, quartâ quaque hora.

404. The quantity of the oil may be diminished or increased, or the frequency of the dose increased or otherwise, according to the circum-

stances of the case. There are almost no complications of phthisis which contra-indicate the use of this remedy, when judiciously prescribed, as respects the dose and mode of exhibition; and especially when employed externally also as hereafter recommended. The terebinthinate substances, in which the essential oil exists in different forms and combinations, are also beneficial when suitably prescribed. The infusion of *pine tops* was praised by Cælius Aurelianus for phthisis; *tar water* was recommended by Bishop Berkeley for this and other diseases; and *tar* was given by Sims for this malady. I have had recourse to these, especially to tar and tar-water. Tar, in the form of pill, with liquorice powder, is often of great service in the colliquative states of diarrhœa, and when there is reason to fear incipient ulceration of the mucous follicles of the bowels. Tar-water, when sufficiently weak, not to be unpleasant to the patient, is also of service in this state of the disease, and in its hæmorrhagic and congestive complications. Indeed there are several states of this malady, and several other diseases, in which both tar and tar-water may be very usefully employed. The injudicious or rather extravagant praises of some writers at the commencement of the last century have caused the complete disuse of an excellent remedy.

405. *Uva ursi*, in powder, decoction, and extract, was recommended for phthisis by Dr. Bourne, and subsequently by Drs. Hamilton and Davy. The tannic and gallic acids it contains, and its astringent and tonic qualities, would justify its use in several states of this disease, especially in the hæmoptysic, and in the colliquative sweats and diarrhœa which occur in the advanced stages. It may, moreover, be combined with other remedies, — demulcent, tonic and anodyne, — with opiates, bitters, &c., according to the peculiarities of the case.

406. *Venesection* and other modes of vascular depletion, as by cupping or leeches, or by the application of these last to the anus, as insisted on by Plenciz and Läkeren, with antiphlogistics, emollients, and demulcents, have been advised by many in the early stage of the malady. At this stage venesection, hardly amounting to more than eight or ten ounces at a time, and repeated according to circumstances and to its effects, has been recommended by Morton, Mead, Pringle, Monro, Fothergill, Salvadori, Stoll, Hosack, Farr, Cheyne, and others. I have stated above (§§ 309—313.) the circumstances in which the practice may be adopted; and that it should not always be accompanied with other antiphlogistic remedies, either in an early stage, or when prescribed for inflammatory or hæmorrhagic complications; for depletion, although manifestly indicated, may be followed, in many cases, by suitable tonics and nutrients, provided that exercise be taken with due care in the open air, and that the *external derivation* about to be noticed (§§ 415, 416.), such as issues or setons, be kept discharging. Rush advised, for cases requiring venesection, recourse to it in preference, in spring and autumn. But this recommendation is in conformity rather with an old custom than with correct pathological inference. Rhodius, Tracy, and Rush considered that an attack of hæmorrhage from the nares, rectum, or even from the lungs, beneficial, and the larger the better, and that it should not be too soon arrested, unless manifestly injurious. The opinion is certainly often correct, but the numerous exceptions should not be overlooked.

407. *Various other substances* have been prescribed for phthisis by eminent writers; and, although they may be of little use, further than as adjuncts to other more beneficial remedies, they may be very briefly enumerated at this place. The *arum triphyllum* was recommended by Burton, in the form of decoction with milk, the *carduus benedictus*, either in decoction, infusion, or extract with senega, by Thilenius; the *eryngium campestre*, by Hoffmann; the *geum urbanum*, by Buckhave, in doses of a scruple and upwards of the powder of the root, as a tonic and astringent; the tops and flowers of *hypericum*, for its balsamic, bitter, and tonic qualities, by Linnæus; the *nasturtium aquaticum*, by Poutrau and Brillonet; *myrrh*, conjoined with *sulphur*, or various other substances, by numerous writers; the *rhus radicans*, by Gibson; the *raphanus*, or horse-radish, by Schenck and Osiander; the *marubium vulgare*, by Alibert, a popular remedy, in various forms of preparation, for pectoral complaints in most European countries; the conserve and other preparations of *roses*, by Moseley and very many other writers; the *phosphoric acid*, by Gordin; the *sulphate of iron*, by Stanger; and *taraxacum*, by Schmidtmann. These hardly require any remark. They may be employed under circumstances which prevent the use of other more beneficial remedies; or in conjunction with such means as have already been advised, as with the Iceland moss, digitalis, conium, &c. or with bitters, as absinthium, calumba, cascarilla, arnica, &c., when a restorative diet is required, or when indigestion, flatulence, or sinking are experienced. In certain states or complications, as in those just named, the preparations of ammonia, as the carbonate, &c., or the æthers, may be conjoined with other means with benefit. Of the etherial preparations, the compound spirit of sulphuric æther, the spirits of nitric æther, and the hydrochloric æther are the most useful. In cases where I have prescribed the hydrochloric or nitro-hydrochloric acids, with or without the hydrocyanic acid, I have often added the hydrochloric or other æthers when the state of the case required such an addition.

408. xiii. Mineral waters have been recommended by several authors; but they require much caution and consideration before entering upon the use of any of them, when the disease has fully declared itself. In the scrofulous diathesis, and when the disease is threatened, or when its prevention should be attempted, these mineral waters are often of great benefit, when taken in proper quantity, and in suitable dilution in certain cases. The quantity of these waters usually recommended is often not duly regulated, or suited to the nature of the case and to the effects produced; and hence they are either inefficacious or injurious. There are three kinds of mineral waters, which, when used in proper quantity and combination, and their effects watched, are sometimes beneficial both in the prevention and in the treatment of the early stages of phthisis; these are the *chalybeate*, the *sulphureous*, and the *alkaline*; each, however, being suited only to certain states or forms of the disease. It should

not, however, be overlooked, that all these waters contain various proportions of different saline ingredients,—the oxides or salts of iron, or sulphuretted hydrogen, or alkaline carbonates, being present in certain of these waters also in various proportions.

409. *a.* The *chalybeate mineral waters* are chiefly indicated in those states of the disease for which the compound iron mixture has been recommended above (§ 378.), more especially in lymphatic and phlegmatic temperaments, and when the pulse is weak, small, or slow, and the blood poor in red globules. Generally the weaker chalybeates, or the stronger more or less diluted, are most beneficial, and should be preferred for cases where their use is of doubtful propriety. The mineral waters of *Aix-la-Chapelle*, especially the sulphuretted chalybeate, have been recommended for this class of cases: but the mineral waters of this country, of a similar composition, are equally appropriate with those; especially the chalybeate and saline spring at *Harrowgate*, which may be taken alternately with the sulphureous waters of that place. The mineral waters of *Kissingen* are also of service early in the disease, or when phthisis is threatened, especially when the several springs are employed under judicious medical direction.

410. *b. Sulphureous mineral waters* are often beneficial in phthisis, especially if the composition of the several springs containing sulphuretted hydrogen gas be such as may be appropriately employed for individual cases. The several springs at *Harrowgate* supply a sufficient variety of composition to suit the various states of different cases. The waters of *Moffat* and *Strathpeffer* are stronger in sulphur than those of Harrowgate, but they present a less variety of composition. The waters of *Enghien* and *Barèges* may also be tried, but they offer even fewer advantages than those already mentioned.

411. *c.* The mineral springs abounding in the *carbonates of the alkalies*, as well as holding various other substances in solution, have likewise been recommended for threatened and incipient phthisis. The chief of these are the waters of *Ems, Seltzer*, and *Vichi*. These are usually most beneficial when taken with milk or with whey. The Ems waters are much praised by BRUCHMAN and others; and the Seltzer by BANG and KRAMER, in this disease, especially when diluted with milk or whey. The waters of *Cauterets* have also been recommended by many; and those of *Bonnes* and *St. Sauveur* of the Pyrenees, have proved most beneficial in several instances which have come before me. Whatever mineral water be adopted, other means, medicinal, regimenal, and dietetic, are generally also required. Some advantage, moreover, is derived by consumptive invalids from change of scene and of modes of living, and from dryness of the air and elevation above the level of the sea, when they visit some of the inland or continental watering places. Increased exercise in the open air and in open day and sunshine is also not devoid of some benefit.

412. xiv. INHALATION of various fumes and vapours, chiefly medicated in various ways, and by diverse means, has been advised by many.—*a.* I have seen several modes of inhalation employed, and have prescribed certain of them, but without any very manifest benefit. The great disadvantage of most of these means is occasioned either by the amount of aqueous vapour thus passed into the lungs, or by the irritating or other effects produced in the air-passages by the ingredients employed. I have already noticed the subject of inhalation above (§ 324.), and when treating of *bronchitis* (see art. BRONCHI § 98. *et seq.*); and the opinion I have stated under this latter head a further experience has fully confirmed. I may mention, however, that the inhalation of sulphuric æther, with the vapour from preparations of conium, was advised by Dr. PEARSON; of vapour containing the fumes of Burgundy pitch, by HOME; of aqueous exhalations from henbane, myrrh, and "naphtha vitrioli" (sulphuric æther), by JOERDENS; of the fumes from pine-tops, and various balsams, by a number of writers; and of tar-vapour, by CRICHTON and PAGENSTECKER. But the usual modes of inhalation, especially those in which inhalers are employed, are most objectionable and much more injurious than beneficial.

413. *b. Weak fumigations* diffused through the apartment occupied by the patient are much more beneficial than any mode of inhalation; and the vapour, or the weak fumes, or rather the odours, exhaled from the substances employed for the purpose of impregnating the air of the apartment, are sufficiently strong to be respired by the patient in most cases. The greatly diluted fumes or vapours proceeding from creasote, from tar, from turpentine or the several terebinthinates, from pine-tops, from various balsams, from the æthers, especially pyroligneous æther or pyroxilic spirit, from cedar, and from resins, gums, &c., independently of any combination with aqueous or narcotic vapours, are generally much more beneficial and pleasant to the patient than the inhalations commonly employed. The embrocations so frequently recommended for this (§§ 321, 322, 403.) and several other diseases act beneficially, chiefly in consequence of the inhalation by the patient of the ingredients as they are evaporated, or as their dilute fumes are exhaled and diffused in the air surrounding him. A young man, who had repeatedly come under my observation in an advanced stage of phthisis, completely recovered his health after he had been for a considerable period employed in the manufacture of creosote. When cough is distressing, the fumes of æther, arising from the sprinkling of one or other of these, especially of the spiritus ætheris sulph. comp., the pyroligneous æther, or pyroxilic spirit, or the hydrochloric æther, or of chloroform, on the bed-clothes of the patient or on any article more or less removed from him, will often have a very palliative effect.

414. xv. THE EXTERNAL MEANS of treating phthisis have been already partly noticed (§§ 319, 323.). —*A.* Amongst these *medicated* and *mineral baths* have been advised by several writers, more especially the warm mineral springs of the continent. Sulphuretted chalybeate baths were recommended by LENTIN; the baths of *Baden* were praised by SCHENCK; and those of *Weisbaden* by RITTER, especially for the early stages of phthisis; but they are more likely to be of service for the prevention of the disease, aided by more beneficial means; for very little dependence can be placed upon thermal springs or baths, either in the prevention or cure of this malady. Whatever

benefit is derived in some cases is to be imputed as much to change of air, exercise, and regimen, as to the effects of the baths.

415. B. *External derivatives*, and *exutories* have been advised for phthisis from the earliest periods of medical history. I have stated above (§§ 319 — 323.) the modes in which these may be employed and the general results of my experience of them. I shall only notice the opinions of a few writers respecting them: the views of many eminent authorities on this important department of medical practice may be gathered from the historical sketch I have given above (§§ 242 — 287.). During the course of my medical experience I have not observed this practice employed in the manner in which it is most efficacious. Tartar-emetic ointments, croton oil liniments, &c., have been frequently resorted to in recent times; but issues and setons have been rarely employed; although the experience of numerous writers, as well as my own experience in several cases, has demonstrated their great utility. The selection of a situation in which an issue may be made or a seton inserted is often the chief difficulty in the way of either. BARTHOLIN directed an issue to be made in the back, below the scapulæ; DUPLAN and RIVERIUS between the scapulæ; GEBEL, DREYSIO and BILLARD, in the upper arm; SIMMONS recommended a seton to be inserted in the nape of the neck; MONRO, PORTAL, and HILDENBRAND in the arm; ZACUTUS LUSITANUS at the edge of the pectoral muscle, near the axilla; WHYTT and RUSH preferred the same situation for a seton, or near the sternum for an issue, LENTIN also selecting these places in preference to others. Whilst these and many other authors have thus resorted to these means in phthisis, they have not considered them suitable to all states or stages of the malady. QUARIN, WINTRINGHAM and SOUVILLE, who have been less in favour of these means than the writers just referred to, consider them worse than useless in the far advanced course of the disease and when there is much exhaustion. Having often employed them with advantage—in some instances in the families of medical men of my acquaintance—I am enabled to state, that I have generally preferred issues, kept discharging by means of a number of peas, to setons; that, when the patient is not much emaciated, some part of the breast, or over the margins of the false ribs, has been preferred; that this practice is of service chiefly in early stages, before cavities are formed, and in the more usual and chronic forms, of the disease; that it is more especially beneficial in the hæmoptysic and congestive complications; and that it should not be resorted to in the more febrile, debilitated, and emaciated cases, and when the signs of cavities are manifest. It ought to be further recollected that time is a necessary element in the development of the effects of this treatment; that the other means of cure, the diet and the regimen adopted, should be restorative and nutritive, without being heating or stimulating, especially as the discharge from the issue or seton becomes copious; and that air and exercise in the open day, avoiding injurious exposure, should not be neglected.

416. C. *Blisters, rubefacients*, and *embrocations* (§§ 319—323.) have been sufficiently noticed. The first of these, when kept discharging for some time or frequently renewed, is often of service, and may be substituted for issues or setons when these latter will not be adopted by the patient. The *embrocations* which I have so often mentioned are of service, both as irritants or rubefacients, and as furnishing the best means of inhalation. *Cauteries*, actual or potential, formerly employed, and recommended by HIPPOCRATES, GALEN, and others of the ancients, and by PORTAL, AULAGNIER, GARDOUIN, &c., among the moderns, are rarely prescribed; and even *moxas*, although much praised by LARREY and other recent writers, are seldom resorted to. *Urtication*, which was recommended by LANGE, is also superseded by other means. That pustular eruptions and purulent discharges artificially produced have more or less influence in delaying or arresting the progress of phthisis, when the disease is not far advanced, are amongst the most important facts in medical practice; but much more is required than an empirical recourse to such means. A knowledge of the cases, states, and stages of the malady in which they are likely to be of service, or at least not to be detrimental, and of the other means, constitutional, local, external, and regimenal, which may be brought to their aid, is essential to success in the employment of them. That the production of a purulent discharge or the formation of a purulent eruption has sometimes cured phthisis, appears to have been known from the earliest periods of medical history. After the appearance of small-pox, it was observed that a copious eruption in that malady often cured pulmonary consumption in an early stage, and as often accelerated the progress of this latter disease in an advanced stage. This was remarked by MUYNIK, BRACHET, and others; and it has been stated by writers that phthisis is rarely observed in persons much marked with small-pox (§ 231.), — a statement which has appeared to be confirmed by my own observation.

417. xvi. STATES OF THE AIR were much discussed by writers from the middle of the last century until early in this, in respect of consumption, and all sorts of air were considered with reference to the cure of this disease. The air of cow-houses was advocated by some, of marshes by others (§ 295.). Even the mephitic air produced by bilge-water (arising chiefly from the action of salt water upon the ship's timbers) was considered by BEDDOES and HARRISON as the cause of the benefit derived from voyaging. The use of fixed air, soon after its discovery, in the treatment of phthisis, was most unprofitably discussed by writers from 1780 to the commencement of this century; and although the influence of the carburetted and sulphuretted hydrogen, and other gases given off from bilge-water, may be considered by some as disposed of, yet it is still viewed as not without some favourable influence by those who believe in the good effects of marshy exhalations in threatened phthisis.

418. That fixed air contained in fluids is a useful palliative in this disease, and for the dyspeptic symptoms which accompany it, cannot be doubted; and that the sulphuretted hydrogen contained in some mineral waters is often beneficial, as most preparations of sulphur are also more or less so, in tubercular states of the lungs, must be admitted, as far as medical observation and experience

warrant the belief. But this refers only to the gases impregnating fluids taken into the stomach.

419. Of much greater importance is the determination of the questions, whether or no the air in very elevated situations, or in low places, and whether that near the sea, or at a distance from it, is the most beneficial to phthisical cases? Or, in other words — 1st, What is the state or states of the air which the phthisical patient may breathe with greatest benefit? 2nd, Should the states of the air, found beneficial in certain seasons, be continued in other seasons? and 3rd, If change of such an air be found requisite, how should it be most appropriately and beneficially changed with the procession of the seasons?

420. 1st. *Sea voyages* were praised by **CELSUS**, **ARETÆUS**, and others amongst the ancients; and by **GRANT**, **SAVARY** (*Lettres sur l'Egypte*, t. iii. p. 8.), and many among the moderns. But it is very doubtful what share of the benefit observed proceeds from the sea air itself, or from the motions and other circumstances connected with the voyage. It is not improbable that the sea air may contain certain elements beneficial to morbid states of the lungs, and sufficient to counteract any injurious influence which humidity alone might produce. But persons living on the sea-coast are not much more exempt from phthisis than those living inland, where equally humid states of air, within the same ranges of temperature, usually exist. A greater exemption may be experienced, but the amount has not yet been ascertained, or even an approximation to it. The ancients inferred benefit from sea air, because the voyages for the cure of pulmonary diseases were generally made to Egypt, and very probably the relief manifested soon after the arrival of patients in that country was partly at least attributed to the voyage. Although Dr. **SMYTH** is not in favour of sea air for consumptive cases, yet I know that voyaging in the Mediterranean and in the Atlantic has been most beneficial in several cases in which I have advised it. But I agree with **CÆLIUS AURELIANUS**, **GILCHRIST**, **BLANE**, **REID**, and many others, in saying that in order to be of service it should be adopted early in the disease; if it be resorted to at a far advanced period, and if a very warm latitude be entered into, the disease will most probably be accelerated to a fatal issue. The doubt expressed by me above (§ 307.) of the superiority of the sea-coast to inland situations, other circumstances being equal, appears to be confirmed by the observations of Dr. **RICHARDSON** respecting the climate of Nubia, of Dr. **BARCLAY** on the climate of Egypt, and of Dr. **ARCHIBALD SMITH** on the influence of high elevation in warm climates on consumption. In *Nubia*, *Egypt*, the South of *Spain*, and at a considerable elevation on the *Andes*, cases of this disease, whether attended by hæmoptysis or not, were remarkably benefited soon after their arrival; and a removal from the last-named place to the sea-coast was often followed by a return of the malady. From the testimony and experience of these eminent writers, and from what other sources of information have furnished, I infer that dry states of the atmosphere, in moderate grades and ranges of temperature, and at considerable or even moderate elevations above the sea-level, are most favourable to consumptive patients; that the places just named, and Malaga, and various other places in Syria and the East, are most to be preferred; and that, before the commencement of the hot season, Nubia, Egypt, and other places, where the temperature rises very high, should be relinquished for others which are more temperate.

421. The *second* and *third* questions are partly answered by what I have now stated; for although a continued residence in these climates may not be injurious to many consumptive patients, yet it may give rise to diseases of a different nature, or may occasion complications of phthisis which otherwise might not have occurred; or it may prove too exhausting, or otherwise injurious to the patient: in many cases, if not in the majority, a change to a more temperate climate is therefore beneficial before the hot season commences; and if the change can be made to a climate both dry and temperate, it will generally prove of the greatest advantage. Patients who are subject to hæmoptysis, or other states of the more usual or the chronic forms of phthisis, will derive very great benefit from a voyage to Alexandria, and a journey thence to Cairo and Upper Egypt, and, having resided there or in Nubia some time, proceeding thence to Syria, they may return by Malaga, Granada, or other places in Andalusia, in April or May, to England; or, if it be preferred, a voyage may be made across the Atlantic early in September, with great benefit; and having crossed the isthmus of Panama, the Pacific may be traversed; and having visited Lima, a residence in the mountains of Peru may be tried at the elevation and in the season found most beneficial for phthisical patients. After a satisfactory residence in this locality, the patient may return to Europe by the same route as that by which he went out, or by one more direct, taking care, however, to return to England about May or June.[*] If this plan be

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[*] There are many places in the south of Spain that may be chosen for winter residences by persons either threatened by, or in the first stage of tubercular consumption, especially in Andalusia; and if the vicinity of Malaga, or of Granada, or of Seville be not selected, other places in the above extensive province may be tried. During the warmer months, the more elevated situations on the southern side, or the southern ridges of the Sierra Morena, furnish many situations which cannot fail of possessing most of the advantages required by phthisical invalids.

Dr. **MITCHELL** (*Brit. and For. Medico Chirurg. Rev.* No. xxxiii. p. 226.) states that "the climate of Algiers, during winter and spring, vies with that of Madeira, — being as warm and steady in temperature, but drier and more bracing."

It has been a generally-received opinion among medical and scientific men that very high elevations above the level of the sea are injurious to tubercular consumption, especially when it is either ushered in, or attended by, or even threatened with hæmoptysis. **DR. ARCHIBALD SMITH**'s very interesting account of the very remarkable benefit he saw, in numerous cases (see above, §§ 420.), derived from residing at an elevation above the sea-level of 5000 to 10,000 feet, completely upsets this opinion. This very able and experienced physician has further remarked on this subject, in a communications he has kindly favoured me with since the earlier pages of this article was published; and he has stated, respecting a diminished or increased frequency of phthisis in the the aborigines of a country by change to a colder or to a warmer climate, or to a higher or lower elevation, "that, as regards Lima and the coast of Peru, generally, the change to the maritime climates of Chili and Ecuador—the first colder, the second warmer—has a decidedly bad effect on the Peruvian phthisical invalid; but the higher elevation on his own mountains of 5000 to 10,000 feet has a decidedly curative influence. In these regions the climate is moderately dry and temperate, favourable to exercise in the open air, and the patient is also removed from a luxurious and sensuous society, as well as from a warm, humid and relaxing atmosphere. Very possibly the decided benefit received by the natives of Peru from the change from followed out for two, or three, or four seasons, at an early stage, with due precautions against injurious exposure, the disease will either be arrested for some years, or altogether overcome, in a great

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coast to mountain may not be equally shared in by strangers. I hope, however, that this may be a fair trial, and, as you recommend navigating by Panama to the Pacific, that you will find room to recommend, on fair trial, to Europeans, the migration to elevated spots on the Andes, from time immemorial known of paramount importance to the native races affected with pulmonary consumption." Dr. **Archibald Smith**'s very long and extensive experience of the diseases in this part of the new world renders his opinion of the greatest value on this subject. He further remarks, "I observe at § 218. what you say with respect to the effect of migration on the Chinese; and I can say that, among the thousands of this race lately introduced into Lima, I never met with an instance of phthisis. It is likely, however, that this disease will show itself in their offspring born in Peru of Indian or dark women. When the Chinese crop their hair, and take on the Peruvian dress, it is not easy to distinguish them from native Peruvian Indians." Is not this last remark in favour of the opinion that the Indian races are offshoots from the Mongolian, or Chinese.

Dr. **Richardson**, in his account of his travels in Egypt and Nubia, published more than thirty years ago, has strongly recommended these countries, and especially the latter, as winter and spring residences for phthisical invalids. The more recent evidence of my eminent friend, the Rev. Dr. **Barclay**, fully confirms this recommendation. The very interesting account given by Dr. **Barclay** of the climate of *Middle and Upper Egypt, Malaga*, &c., is so very important to our profession, and to phthisical patients, coming, as it does, from one whose great talents and acquirements I have long known and admired, that I quote it at this place without abridgment, of which indeed it does not admit :—

" The object of this communication is to draw attention to those characteristics of the Egyptian climate by which an opinion may be formed of its curative influence in cases for which a removal to a milder and warmer atmosphere is usually recommended. The result of my own observation and experience, during five months spent in that country, is a thorough conviction that there is no accessible part of the world so well adapted for the relief of most of that formidable class of diseases to which the respiratory organs are subject. In venturing to express this opinion, however, I am far from affirming that all Egypt, or any part of Egypt at all seasons, fulfils the conditions required in a climate suitable for such cases. On the contrary, it will be readily perceived, that no part of the Delta is at any season adapted to patients who are subject to these affections, nor, it may be added, to those who are either dyspeptic or rheumatic; and from the beginning of May to the end of September the heat in every part of Egypt is too great for a European constitution weakened by disease But in Middle and Upper Egypt, from the beginning of October to the end of April, the invalid may breathe, under a bright and cloudless sky, an atmosphere at once of a warm and equable temperature, of perfect purity, and free from all excess of humidity. The climate of other regions may be equally distinguished by one or more of these properties (though even that is doubtful); but assuredly there is no other habitable part of the globe in which they are all combined in so great perfection.

" The malady for which I sought relief in a southern climate was chronic bronchitis in its most aggravated form. All the usual remedies, both external and internal, had been resorted to, and steadily persevered in, under the ablest medical advice, but with little temporary and no permanent benefit. I had tried with the same unfavourable result those places on the south coast of England which are usually recommended to invalids. The symptoms obstinately resisted every remedial measure. The chronic character of the disease was frequently exchanged for attacks of a subacute form. These always commenced with inflammation of the pharynx, creeping insidiously down the glottis and trachea to the bronchial tubes, which became gorged with mucus throughout their whole extent; and on every spot on which the stethoscope could be planted over the lungs the mucous *râle* was to be heard. Dyspnœa, accompanied with loud wheezing, was at all times distressing; but its nocturnal exacerbations, which invariably occurred after a short sleep, like fits of spasmodic asthma, were often so fearfully violent as to threaten suffocation. The digestive organs were deranged, I had no appetite for food, my frame was emaciated, and my strength prostrated.

" I was so enfeebled as to be unable to encounter the voyage till the month of November; and thus I lost two months of the season suitable for the residence of an invalid in that country. Yet the benefit which, by the blessing of Providence, I reaped from that delicious climate, was most signal; and far exceeded all that my most sanguine hopes had ventured to anticipate.

" On the passage outward I stopped five days at Malta, but found the heat so oppressive in the day-time, and the chills in the evening so severe, that I was glad to make my escape. The extreme humidity of the atmosphere in that island, notwithstanding its high temperature, must always render it, I apprehend, an unfit resort for a bronchitic patient; and the greatness of the diurnal range of the thermometer, at least in winter, makes it questionable how far it is an eligible residence for consumptive patients. It is believed that an inquiry into *results* will not tend to give a favourable idea of its sanative influence on that class of complaints. Of the climate of Alexandria also I have reason, as I shall show afterwards, to speak unfavourably. In Cairo, however, a very different climate was found; and I had not been many days there when I began to experience its effects in allaying the irritability of the respiratory mucous membrane. The coldest season there is the latter part of December and the early part of January; and though the temperature even then is equal to that of our best summer weather, yet the evenings are somewhat chill. The following observations, made with the register thermometer and Dollond's hygrometer, show the temperature and the dryness of the atmosphere at Cairo during the coldest fortnight of the year :—

Date.	Lowest temperature by night.	Highest temperature by day.	Diurnal range.	Degrees dry.	Degrees damp.	State of weather.
	°	°	°	°	°	
Dec. 25.	59	64	5	7	..	Bright sunshine.
„ 26.	58	63	5	7	..	Ditto.
„ 27.	58	62	4	5	..	Ditto.
„ 28.	57	60	3	..	5	Rain and blowing.
„ 29.	57	60	3	1	..	Showery.
„ 30.	58	60	2	..	4	Wind and rain.
„ 31.	59	64	5	5	..	Bright sunshine.
Jan. 1.	60	64	4	8	..	Ditto.
„ 2.	57	62	5	4	..	Cloudy.
„ 3.	58	63	5	0	0*	Ditto and blowing.
„ 4.	58	64	6	5	..	Bright sunshine.
„ 5.	57	64	7	4	..	Cloudy.
„ 6.	58	61	3	..	4	Drizzling.
„ 7.	57	60	3	..	1	Cloudy and windy.

" From these observations it will appear that, warm and equable as the winter temperature is at Cairo, the weather at that season is not free from frequent and sudden changes. It is in Upper Egypt that the invalid must seek entire exemption from these; and there he will not be disappointed.

" While I was there my register was kept on the Nile, and consequently it shows a lower temperature, at least in the night-time, than would be denoted at a little distance from the river; while the dryness indicated by the hygrometer in the latter case was many degrees greater than that registered on the river.

"The following table contains the result of the observations noted between Thebes and Asouan, the uppermost town in Egypt, and from these an idea may be formed of the winter climate in that region :—

Date.	Lowest temperature by night.	Highest temperature by day.	Diurnal range.	Degrees dry.	Degrees damp.	State of weather.
	°	°	°	°	°	
Jan. 17.	64	70	6	7	..	Cloudless sky and bright sunshine every day; the firmament blazing with stars every night; no evening chills.
„ 18.	63	68	5	7	..	
„ 19.	66	70	4	5	..	
„ 20.	64	69	5	12	..	
„ 21.	64	71	7	7	..	
„ 22.	69	72	3	6	..	
„ 23.	68	72	4	10	..	

"The benefit I derived from breathing the genial air of the Thebaid was very decided. The periodical night many cases — indeed in most, if it be not delayed to a too far advanced stage.

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* The zero of the hygrometer corresponds to summer drought in Britain.

422. The diet in phthisis has been already discussed in general terms, and chiefly with respect to my own experience (§§ 299—301.), but a few authorities and particulars may be further adduced at this place.—*a*. **Hippocrates** advised, for phthisis, *animal food* to be taken in small quantity, and often, when fever is absent; and the opinion has been followed by **Salvadori**, **May**, **Rush**, **Vojel**, **Rollo**, and **Kinglake**. Animal fats, marrow, and fat meats were recommended by **Lange** and **Bertin**. The circumstances in which these may be adopted have been stated above (§§ 299—301.).

b. A *fish diet* is often of service, especially in the more chronic and hæmorrhagic states, or when the biliary organs are congested; but on all occasions the white kinds of fish should be selected, and always be boiled. Oysters were praised by **Tulpius** and **Sims**, but they ought to be taken immediately upon being opened, and a small number only at one time.

c. *Vegetable food* has been advised by many writers in preference to any other, whilst as many recommend a due proportion of animal and vegetable diet. Of the more unusual articles, at least in this climate, new figs, dates,

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attacks, though still occurring, were less violent and of shorter duration; my breathing was greatly relieved; and my strength was so far recruited, that I was able, without fatigue, to make daily excursions, sometimes of many miles, to the monuments with which this part of the valley of the Nile is studded.

"At Thebes, which for several reasons should be made head quarters in Upper Egypt, the day temperature, from the middle of January to the middle of February, ranges from 68° to 78°, and after the latter date the heat becomes rather too great to be borne with comfort. The invalid should then commence his downward voyage, and by the time he reaches the latitude of Cairo he will find the climate there nearly as delightful as that which he left at Thebes. My register during the first week of March at Cairo was as follows:—

Date.	Lowest temperature by night.	Highest temperature by day.	Diurnal range.	Degrees dry.	Degrees damp.	State of weather.
	°	°	°	°	°	
March 1.	66	72	6	9	..	Gentle breeze, sunny.
„ 2.	69	74	5	4	..	Ditto, ditto.
„ 3.	68	75	7	0	0	Fog.
„ 4.	68	76	8	6	..	Calm and sunny.
„ 5.	71	74	3	..	2	Haze.
„ 6.	69	72	3	6	..	Cloudy and sunny.
„ 7.	65	69	4	6	..	Drops of rain.

"In a city like Cairo, with a dense population of more than two hundred thousand people, and with narrow streets walled in by lofty houses, and constantly watered to lay the dust, the air can neither be so pure nor so dry as in the desert. Accordingly the medical gentlemen of Cairo are in the habit of sending almost all their convalescent patients to reside for some time in the adjoining desert, to enjoy the benefit of its invigorating air. In it there is no water, either running or stagnant, to produce humidity by evaporation, nor is there any decaying matter, either vegetable or animal, to taint the air with noxious exhalations. It is in the desert, therefore, that the qualities of warmth, equability, dryness, and purity, which are characteristic of the Egyptian climate in general, are to be found in the most perfect union. The soothing influence of the desert air on delicate organs of respiration, and its invigorating influence on a debilitated frame, can be appreciated by those only who, like myself, have experienced its marvellous effects. It is at once balmy and bracing; and the invalid, while breathing it, feels as if he were drinking in health at every pore. I quitted Cairo for the desert of Ghezeeh on the 12th of March, and took up my abode in the neighbourhood of the Pyramids; and there a sudden change came over me, as if by magic. The second night I passed in the desert was marked by sound and uninterrupted sleep, and the absence of the periodical fit of dyspnœa; the first occasion on which I had enjoyed the one, or had been exempted from the other, for more than two years. My appetite soon became *excessive*; both the flesh and the strength I had lost during my illness were restored; every symptom of my complaint disappeared; and at the end of a month I returned to Cairo in perfect health. The following table contains the meteorological register kept by me while I lived in the desert:—

Date.	Lowest temperature by night.	Highest temperature by day.	Diurnal range.	Degrees dry.	Degrees damp.	State of weather.
	°	°	°	°	°	
March 13.	63	69	6	10	..	High wind.
„ 14.	63	70	7	12	..	Bright sunshine.
„ 15.	63	68	5	12	..	Ditto.
„ 16.	63	68	5	13	..	Ditto.
„ 17.	63	67	4	13	..	Ditto.
„ 18.	63	70	7	12	..	Ditto.
„ 19.	63	73	10	14	..	Ditto.
„ 20.	67	72	5	17	..	Ditto.
„ 21.	63	70	7	18	..	Ditto.
„ 22.	63	71	8	18	..	Ditto.
„ 23.	66	76	10	19	..	Ditto.
„ 24.	71	76	5	16	..	Cloudy.
„ 25.	67	71	4	10	..	Ditto.
„ 26.	63	71	8	13	..	Bright sunshine.
„ 27.	63	71	8	12	..	Ditto
„ 28.	64	73	9	11	..	Ditto.
„ 29.	63	74	11	15	..	Ditto.
„ 30.	63	71	8	12	..	Ditto.
„ 31.	66	71	5	12	..	Cloudy.
April 1.	67	81	14	23	..	Khamseen.
„ 2.	67	72	5	10	..	Cloudy and blowing.
„ 3.	65	72	7	11	..	Bright sunshine.
„ 4.	68	71	3	12	..	Ditto.
„ 5.	65	71	6	16	..	Ditto.
„ 6.	65	75	10	18	..	Ditto.
„ 7.	64	70	6	3	..	Rain.
„ 8.	65	71	6	10	..	Bright sunshine.

"The only other place in Egypt whose meteorology it seems necessary to notice is Alexandria. When it is borne in mind that this city is surrounded on three sides by the Mediterranean Sea, and that on the land side it is enveloped by the Lake Mareotis, a moist atmosphere may be expected; and accordingly the degree of humidity indicated in the following extract from my register is excessive. In this respect the state of the atmosphere in Alexandria, during the early part of May, will be found to contrast remarkably with that of Cairo and its vicinity during the latter part of April; while the greater equability of temperature in the former city, both from day to day, and during the twenty-four hours, is no less observable:—

Place and Date.	Lowest temperature by night.	Highest temperature by day.	Diurnal range.	Degrees dry.	Degrees damp.	State of weather.
Cairo.	°	°	°	°	°	
April 19.	68	70	2	6	..	A gentle breath of wind and bright sunshine by day. Always calm towards evening and during the night.
„ 20.	67	70	3	5	..	
„ 21.	66	72	6	5	..	
„ 22.	67	72	5	4	..	
„ 23.	69	74	5	9	..	
„ 24.	70	77	7	9	..	
„ 25.	75	79	4	5	..	
„ 26.	72	75	3	4	..	
Alexandria.						
April 28.	70	73	3	..	10	Sunshine and calm.
„ 29.	70	73	3	..	13	Ditto ditto.
„ 30.	71	73	2	..	12	Ditto ditto.
May 1.	72	74	2	..	15	Ditto ditto.
„ 2.	72	74	2	..	14	Ditto ditto.
„ 3.	73	75	2	..	15	Ditto ditto.
„ 4.	72	74	2	..	14	Ditto ditto.
„ 5.	73	76	3	..	15	Ditto ditto.

the nuts yielding the palm oil, olives, &c., are the most likely to be of service. Grapes, both recent and dried, were praised by **Riverius**; pickled red-cabbage by **Lange**, and cucumbers with vinegar and sugar, by **Schmalz, Frize, Quarin, Marx**; but these last should be thus dressed without having had their outer rinds removed. Of oranges, lemons, limes, &c., the utility is manifest.

423. *d. Milk* has always received great commendation in phthisis, but writers have differed respecting that which is most beneficial. Thus **Zacutus Lusitanus** and **Bleony** prefer human milk; **Aretæus, Burserius**, and **Stoll**, asses' milk; **Diemerbroeck** and **Velschius**, goats' milk; **Schenck**, either asses' or goats' milk; **Hippocrates**, either mares' or asses' milk; and **Heister**, the whey of cows' milk. **Stoll** considered that asses' and human milk should be diluted, and that they are injurious in the inflammatory complications and in the last stage of the malady. Whatever may be the diet and regimen adopted, milk of various kinds, in suitable forms and states of dilution, constitutes an important part of the treatment of phthisis.

424. *e. The beverages* allowed the patient should depend on the form and stage of phthisis. In an early stage whey is one of the best that can be taken. At a far advanced stage, or if diarrhœa be present, it is apt to run off by the bowels. Fermented whey, or serum of milk, or the whey of butter-milk, or recent butter-milk, may be given according to circumstances. In northern or Scandinavian countries, and also among the Tartars, the fermented serum of milk is very commonly employed, and it has been recommended by **Sievers** and others. Spruce-beer is one of the best beverages that can be used; weak tar-water is also sometimes beneficial. Seltzer-water, with milk, and lime-water or Carara-water, with milk, when the bowels are much relaxed, are also of service.

425. *f.* In recommendation of *exercise* in the open day, according to the strength and state of the patient, it is unnecessary to add anything to what has already been stated. Of all kinds of exercise, walking and horse-exercise are the best. Although the latter was considered of little use by **Quarin**, yet by **Sydenham, Haller, Marx, Darwin**, and others mentioned in the historical sketch (§ 214. *et seq.*), it was strongly recommended. **Stoll** ad-

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"How far Alexandria, during the months of March and April, may be a more suitable residence than Madeira or Italy for those whose complaints require a climate at once warm, equable, *and moist* I leave it to gentlemen of the medical profession to judge; but I do think myself fully warranted to denounce it as a most unsuitable place for a bronchitic patient. During all the time I was there I felt as if inhaling steam; my breathing was excessively affected, and my whole system was languid and relaxed. These effects, however, by the time I had been twenty-four hours at sea, were completely dispelled, leaving no doubt whatever as to their cause.

"I may add, that dyspepsia is very prevalent among the European residents in Alexandria; and I was informed that cases of pulmonary consumption, though not common, do occasionally occur among the natives of the whole northern seaboard of Egypt; but the inhabitants of Middle and Upper Egypt, as far as I could learn, are entirely exempted from that fatal disease. The prevailing maladies throughout all Egypt are dysentery and ophthalmia; both induced, it is believed, by exposure of the heated frame to currents of cold air.

"These observations on the subject of Egyptian climate would be very incomplete if I failed to notice its influence in arresting hæmoptysis. Several instances of its efficacy in that respect were mentioned to me, and one very decided case fell under my own observation. A. B., a middle-aged gentleman, of a clear and florid complexion, had been for years afflicted with this complaint to an alarming extent. He had spent a winter in Italy without experiencing the smallest mitigation of his ailment. He had next been sent to Madeira, and there the malady was very greatly aggravated. He was at Malta when I went to Egypt; but, finding no relief there, he came to Cairo in the end of December, and took up his abode at the hotel at which I lodged. The effect of the change of climate was immediate. The spitting of blood ceased at once, nor did it ever recur during his stay at Cairo, which was prolonged till the end of April. He then went to the south of Spain, and remained there till the month of June, when he returned to England, apparently in perfect health, and fully resolved to spend the whole of the following winter in Egypt with the view of confirming his cure.

"The transition from the climate of Egypt to that of Britain is too violent to be hazarded by one whose respiratory organs are in a delicate or dubious condition, especially as the season at which it is necessary to quit the one country is far from being genial in the other. I therefore stopped in Spain on my homeward passage, and spent the latter part of May and the greater part of June in that country and in Portugal. Having heard that the air of Malaga was remarkable for its mildness, I repaired thither, and was both delighted and surprised to find in Europe a climate scarcely inferior in any respect to that of the latitude of Cairo. The register I kept while there, and from which I subjoin an extract, shows a temperature which was probably only a few degrees lower than that of Cairo at the same date, while its equability was greater than I had noted anywhere except at Alexandria; and what is still more remarkable, the dryness of its atmosphere exceeds that of Cairo, and contrasts surprisingly with the humidity with which the air of Alexandria is loaded.

"The atmospheric conditions indicated by the following table are doubtless to be referred, partly to the geological structure and the physical conformation of the country around Malaga, and partly to the latitude in which it is situated. I am persuaded that, in a therapeutic point of view, the climate in this part of Andalusia is deserving of more attention than it seems hitherto to have received. Those who take it for granted that the climate of Italy must be the mildest and warmest in Europe, seem to forget that Malaga is 248 miles farther south than Naples, 318 miles farther south than Rome, and 518 miles farther south than Venice; and those who have not adverted to the fact will probably be surprised to find that it is 5 miles farther south than Algiers. Both Gibraltar and Cadiz are somewhat south of Malaga, but both have a great diurnal range of temperature, and are nearly equal to Alexandria in the humidity of their atmosphere; the one standing on an almost insulated rock in the Mediterranean Sea, and the other on a narrow spur of land projecting into the Atlantic Ocean.

Date.	Lowest temperature by night.	Highest temperature by day.	Diurnal range.	Degrees dry.	Degrees damp.	State of weather.
	°	°	°	°	°	
May 20.	70	72	2	9	..	Bright sunshine.
„ 21.	70	73	3	12	..	Ditto.
„ 22.	71	73	2	12	..	Ditto.
„ 23.	69	72	3	11	..	Rain.
„ 24.	67	70	3	10	..	Ditto.
„ 25.	66	69	3	10	..	Ditto.
„ 26.	68	70	2	14	..	Bright sunshine.
„ 27.	69	72	3	16	..	Ditto.
„ 28.	69	73	4	15	..	Ditto.
„ 29.	69	73	4	15	..	Ditto.
„ 30.	69	72	3	16	..	Ditto.

"In the beginning of June I moved northward to Lisbon; but on its climate and that of delightful Cintra no information is needed. In the end of June, 1853, I returned to Scotland; and though I was threatened soon after I reached home with a recurrence of bronchitic symptoms, these *now* yielded readily to medical treatment. I am most thankful to be able to add, that during the last twelvemonth I have enjoyed excellent health, nor have I been affected, during that time, by any of the changes of weather to which our variable climate is subject." — *The Climate of Egypt*, by the Rev. Thomas Barclay, D.D. 8vo. Edinburgh, 1854.

vised it in the non-inflammatory states, and when the abdominal viscera were torpid or congested. In the inflammatory complications, active exercise, either on horseback or otherwise, can rarely be taken.

426. In concluding the above imperfect view of the treatment of phthisis, it will be manifest that no one plan of cure, class of medicines, kind of diet, or regimen, — no single method, whether medicinal or regimenal, or both, is appropriate to all cases, or even to the great majority of cases, of phthisis. The rational physician, after having endeavoured to ascertain the existing morbid conditions, will merely select and combine, from the stores above indicated, such means as he believes to be most energetic in arresting, counteracting, or removing these conditions, as far as circumstances may warrant the attempt or may promise success.

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TYMPANITES.—(From *τυμπανον*, a drum). *Τυμπανιτης, τυμπανιας*, Hippocrates, Celsus, Galen;—*Tympanites, Tympanitis*, Auct. Latin;—*Tympanites*, Sauvages, Vogel, Sayar, Cullen, &c.;—*Affectio Tympanitica*, Hoffmann;—*Tympanita*, Sennert;—*Meteorismus*, Sagar, et auct. var.;—*Emphysema Tympanites*, Parr;—*Tympania*, Ploucquet;—*Emph. Tympaniticum*, Young;—*Emph. Abdominis*, Good;—*Hydrops siccus*, Auct.;—*Windsucht, Trommelsucht*, Germ.;—*Tympanite*, Fr.;—*Tympanitide*, Ital.;—*Tympany, wind dropsy, dry dropsy, inflation of the abdomen.*

1. Classif.—4. *Class*, 6. *Order* (Cullen);—
6th *Class*, 2nd *Order* (Good).—I. Class;
I. Order. (*Author in Preface.*)

2. Definit.—*An inordinate generation and accumulation of a gaseous fluid within the digestive canal, generally with retention of it, occurring chiefly symptomatically, either terminating acute disease, or complicating chronic affections, and occasioning great abdominal distension, and a drum-like sound on percussion.*

3. I. Pathology. *Tympany* is generally the result of greatly impaired vital power, as manifested chiefly through the organic or ganglial nervous system upon the digestive canal, whereby not only is the tonicity of the coats of the canal remarkably impaired, but also gaseous fluids are exhaled from the digestive mucous surface. That the air is generally contained in the canal, where it is retained either by spasm in parts of the canal near to its outlets, or by the inability of the muscular structure of the canal to expel it, cannot be doubted. It has been supposed by some writers that the air may be on some occasions exhaled into the peritoneal cavity. If this occurrence take place at all, it must result from the decomposition of matters effused into the cavity, as in cases of chronic peritonitis, or of puerperal peritonitis, or of perforation of the intestines, when some of the intestinal contents have passed into this cavity. The occurrence of tympany from these changes are however rare; but less rare when the intestines are perforated by any of the causes of this lesion of the intestines. (See *Art.* Intestines, § 29.).

4. Several varieties of tympany have been enumerated by writers of the seventeenth and eighteenth centuries, according as the gaseous accumulation has occurred in the advanced course of acute maladies, or has complicated chronic diseases, the primary affections, with which tympany is associated, furnishing the basis of arrangement. Of these it is quite unnecessary to take any notice, as such occurrences of tympany are merely contingencies of advanced and dangerous diseases, and are merely symptoms of these, or of hysterical or uterine disorders; often, however, assuming very prominent and distressing characters, especially in the last stages of peritonitis, of puerperal and malignant fevers, &c. That the air which accumulates in the digestive tube in these and various other circumstances of disease cannot arise, to any great amount, from the decomposition or retention of alimentary materials, or of morbid secretions accumulated or retained in the canal, is demonstrated by the absence of these sources of the gaseous collection in the more extreme cases. We are compelled, therefore, to view the accumulation of air as the result of a morbidly increased exhalation of it from the digestive mucous surface, resulting from depressed vital or organic nervous power, in connection with lost or impaired tone of the muscular coats of the canal; this last condition, equally with the augmented exhalation, proceeding from the loss of vital power. According to this view *tympany* is merely an extreme state of *flatulence* (*see that article*), the gaseous exhalation having accumulated in the former, so as to produce extreme distension, but being discharged in the latter at intervals or absorbed.

5. That this exhalation must necessarily proceed from the blood, in great measure, or in as far as it does not arise from the decomposition of alimentary matters, or of the secretions, must necessarily be inferred, particularly in the more extreme and sudden accumulation of the gaseous fluid. John Hunter and Cullen believed that the fluid was thus generated, and Majendie and Gerardin endeavoured to prove the occurrence by experiment. They included a portion of intestine between ligatures, returned it into the abdomen, yet air, nevertheless, was found in it, although it contained no materials for the generation of air. That the air was exhaled from the digestive mucous surface had long been believed in, and supported by observation and analogy. Fabricius Hildanus, Hoffmann, Portal, Vidal, Gaspard, Nysten, Merat, and many others have contended for this doctrine, and have adduced facts in support of it. Bichat has shown that friction with sulphur communicates the odour of sulphuretted hydrogen to the gas which collects in the bowels. The swimming-bladders of fishes are known to be supplied with air from the blood only; and Blainville, Dumas, Majendie, and others have shown that a division of the pneumo-gastric nerves is followed by gaseous distension of the stomach.

6. Tympanitic distension of the abdomen may therefore be referred — firstly and chiefly, to the extrication of air from the digestive mucous surface, owing to the states of organic nervous endowment, or to the irritation or morbid action of matters received into the alimentary canal, as in various kinds of poisoning, or to changes in the blood itself; secondly, in a small degree from the deglutition of air with the food or with the saliva; and thirdly, and in a very variable degree, from the decomposition or fermentation of alimentary matters, or of secretions and excretions. In cases of weak digestion, or when the organic nervous influence is much depressed, the quantity of air which may be formed, as shown by Dr. Hales, from the fermentation of fruit or raw vegetables in the stomach is often very great.

7. According as either of these sources of gaseous collections in the digestive canal predomi-

nates, or is increased, so may the nature of the gaseous fluid be supposed to vary. The states of the blood, the nature of the ingesta, whether alimentary, medicinal, or poisonous, the seat of the collection, will severally modify the composition of the gaseous fluid. MM. JURINE and CHEVREUL have shown that generally the proportions of oxygen and carbonic acid decrease, while that of nitrogen increases, in descending from the stomach to the rectum.[*] Although there does not appear to have been any analysis of the air collected in tympany, yet there is every reason to infer that it does not materially differ from that usually formed in the digestive canal, unless under the influence of acute or malignant diseases, when, with an admixture of carbonic and nitrogenous gases, and a little hydrogen, sulphuretted, carburetted, and even phosphoretted hydrogen, may severally exist in varying proportions.

8. II. THE CAUSES OF TYMPANY.—*whether predisposing, exciting, concurring or determining*—are in some respects the same as those which are noticed under the head FLATULENCY; but they exist in the former, or are rather associated, with one or more of the following pathological states:—1st, with mechanical or other obstruction to the discharge of the gaseous exhalation from the alimentary canal; 2nd, with impaired or lost contractile power of the muscular coats of the canal; 3rd, with alterations of the blood from absorbed matters or from vital changes, affecting the absorption of gases from the air, or the generation or extrication of them from the blood; 4th, with changes in the circulation in the lungs, and in the respiratory functions. Where one or more of these conditions are present, and in proportion as they are increased by depression or exhaustion of the vital manifestations or endowments of the digestive canal, in so far will the tympany become remarkable or extreme, and the possibility of its removal be diminished.

9. The *causes* of tympanites, or rather the *circumstances*, in which flatulent distension of the abdomen chiefly occur, are pathological, or consist of antecedent disorders or most dangerous organic changes. Whilst such disorders are productive of the less severe and dangerous states, or those which more nearly approach the conditions described under the head Flatulence, the most dangerous organic changes and malignant maladies give rise to the extreme instances of meteorismus or tympany. The *slighter* cases of flatulent distension are produced by the nature of the food, especially by saccharine and acescent matters and vegetables, by indigestible and otherwise injurious articles of food, by constipation or the retension, by mechanical or vital obstruction, of the intestinal excretions, as in cases of colic and ileus, and by hysteria or uterine and spinal irritation.

10. The *extreme* instances of tympany occur chiefly after poisonous ingesta, more particularly after poisonous meats, poisonous fish and shell-fish, and indeed during the last and most dangerous stage of poisoning by other deleterious agents (see art. POISONS generally, and especially §§ 427—528.); in the advanced stages of puerperal fevers and puerperal peritonitis; in gastritis and interitis, particularly when perforation of the intestinal canal has taken place, and then air may escape into, or be developed in, the peritoneal cavity; in misplaced gout of the stomach or bowels; and in the last stage of adynamic and typhoid fevers, and of malignant continued and eruptive fevers. They also occur as terminations of fatal ileus, of hernia, of intersusceptions and strictures of the bowels, of lead colic, &c. Even a moderate degree of tympanitis in adynamic or typhoid fevers should be viewed with alarm, inasmuch as it is an indication of ulceration of PEYER's glands.

11. III. The SIGNS and SYMPTOMS of gaseous distension of the abdomen are very manifest, and even the seat of distension may be correctly inferred, especially when it is not extreme. *A.* Palpation and percussion, in some cases even simple inspection, of the abdomen, are sufficient to show the seat and nature of the morbid condition. When the distension is chiefly of the stomach, the region of this organ is elevated above the margin of the false ribs, and the ensiform cartilage is protruded, the lower abdominal regions being less prominent. A similar elevation of the upper regions of the abdomen exists when the colon is the chief seat of distension; but the course of the colon, from the distended cæcum to the termination of the bowel, may be observed on inspection; and it is further evinced by the hollow sound on percussion, especially when the cause of obstruction to the escape of flatus exists in or near to the sigmoid flexure or rectum. In the extreme instances of tympany, arising from any of the causes stated above (§§ 8—10.), the inflation is generally greatest in the small intestines, although it may be more or less in other portions of the digestive tube. In cases of hysteria, the distension is more limited, varies in its seat, and in the sympathetic sensations and pain it occasions; and, owing to the spasm and contractions, successively affecting different portions of the tube, occasions borborygmi, and the propulsion of flatus into the stomach and œsophagus. The mechanical effects of abdominal inflation are chiefly the pressure of the diaphragm on the heart, lungs, and large veins, and the arrest of the peristaltic motions of the intestine and of the propulsive efforts by which the intestinal contents are excreted. To these various subordinate effects others may be added, consisting of disturbance and arrest of the several secreting excreting functions, of congestion of the lungs and large vessels, and of imperfect oxygenation of the blood, &c.

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[*] *In the Stomach.*	Oxygen . . .		11·	
	Carbonic acid . .		14·	
	Hydrogen . . .		3·55	
	Nitrogen . . .		71·45	
			100·	
In Small Intestines.	Carbonic acid . .	24·39	40·6	25·0
	Hydrogen . . .	55·53	51·15	8·4
	Nitrogen	20·08	8·85	66·6
	In three cases.			*In one.*
In Large Intestines.	Carbonic acid . .		43·5	70·0
	Carburetted hydrogen with trace of sulphuretted hydrogen .		5·47	11·6
	Nitrogen . . .		51·03	18·4
In the Cæcum.	Carbonic acid . .		12·5	
	Hydrogen . . .		7·5	
	Carburetted hydrogen		12·5	
	Nitrogen . . .		67·5	
			100·	
In the Rectum.	Carbonic acid . .		42·86	
	Carburetted hydrogen		11·18	
	Nitrogen . . .		45·96	
			100·	

12. *B*. The *source* and *nature* of the abdominal inflation are to be inferred chiefly from the history of the case; from the antecedent disorder; from the seat, nature, and duration of pain; from the indications furnished by percussion of the several abdominal regions, and from the states of the excretions and of the pulse and tongue, with the various constitutional symptoms.

13. The flatulent distension is generally that of the intestinal canal, and not of the peritoneal cavity, although I would not say that this latter may not in rare cases be its seat, especially if the fluids effused into this cavity undergo more or less of decomposition previously to dissolution; but it is not improbable that the instances of gas thus evolved in this cavity, as observed by HEISTER, DUSSEAU, LIEUTAND, MORGAGNI, PORTAL, and others, are merely those in which the gas had escaped into the cavity owing to a perforation of the digestive canal. Tympanites has been occasionally observed in most of the organic lesions affecting the biliary organs, the digestive tube, and the abdominal and pelvic viscera. It is often an attendant on Gout of the stomach or intestines.

14. *C*. The *appearances* observed in fatal cases are a very large proportion of those lesions which have been very fully described under the heads DIGESTIVE CANAL and INTESTINES. In some cases the distension of the tube has been remarkably great throughout the greater part; and in others it has been more limited; as to the CÆCUM and COLON (*see those articles*) It has rarely been such as to rupture the bowel; sphacelation of the more distended portions being more common. The small intestines, especially the ileum, are always remarkably distended by flatus, and the glands, more particularly PEYER's, are often more or less ulcerated, &c.

15. IV. THE TREATMENT *of Tympany* is generally difficult, often hopeless, and always dependent upon the pathological conditions of which it is merely a symptom or contingent effect. In many cases it is productive of so much and so urgent distress that it becomes requisite to attempt the removal, or the amelioration of it, before the morbid states, from which it results, should occupy our attention with the view of directing the means of cure to them more especially. The *indications* are therefore:—1st, to remove the tympanitic distension by such means as we possess, when it is distressing and most urgent; and 2nd, to subdue the pathological states upon which the distension depends, by appropriate treatment, either when this urgency is removed or does not yet exist.

16. i. *The removal of the flatulent distension* of the intestines by mechanical means was first recommended by Dr. DARWIN to be attempted by the introduction of an enema-pipe into the rectum, in order to remove the resistance of the sphincter ani to the passage of flatus. TENKA proposed that the gas should be removed by the air-pump; and Dr. OSBORNE of Dublin adopted this means, in the mode most likely to render the recommendation successful. After other means had failed, he introduced a gum-elastic tube of nearly three feet in length, with a button and hole at its extremity, and, having applied to it a stomach-pump, he proceeded to withdraw the gas, and "was enabled to do so with few interruptions, which were speedily overcome either by shifting the place of the tube in the intestine, or by injecting warm water to clear the holes by accidental stoppage. In about an hour the abdomen was reduced to nearly the natural size." (*Lond. Med. Gaz.* vol. vii. p. 825.) Dr. GRAVES employed similar means with success in two cases. (*Lond Med. and Surg. Journ.* vol. ii. p. 781.) I had recourse to it in one case, with temporary benefit, and have advised it in consultation in two or three instances, but in neither with permanent advantage. It should not, however, be neglected, as more or less relief is produced by it. In many of the more severe cases I have prescribed enemata containing the extract or confection of *rue*, or *asafœtida*, or both rue and asafœtida, and enemata with *oleum olivæ* and *oleum terebinthinæ*, or the other carminative injections recommended for the removal of obstinate CONSTIPATION.

17. Whilst the operation of these and similar means is expected, *frictions* over the abdomen with either of the *liniments* referred to in the APPENDIX (F. 311.) may be resorted to, and medicines may be exhibited by the mouth. When the tympany is not attended or caused by mechanical obstruction, and is to be imputed rather to a paralysed state of the muscular coats of the canal than to either constriction or strangulation, then the extract of nux vomica in small doses, or the usual carminatives, especially rue, asafœtida, capsicum, turpentine, &c., are often of service. Turpentine, either as a confection, or as a draught, with the oleum olivæ, or ol. ricini, on the surface of an aromatic water, or of common gin, in cases of hysterical tympany, or of spirit-drinkers, if prescribed with discrimination, is the most efficacious, especially if enemata or liniments with this substance be employed also.

18. When the tympanitic distension has arisen from obstruction in the vicinity of the cæcum or in the large bowels, then the injections into the latter should consist chiefly of warm, oleaginous, and saponaceous substances. Olive oil in large quantity may be thus employed, and this oil may be taken in small and frequent doses, oleaginous frictions being also resorted to. In several instances where tympany was caused by the obstruction arising from hysterical pica — by chewing paper in two cases, by sealing wax in one case, and by bleached wax and spermaceti in another, the obstruction was removed, in all, by these means, the causes of the disorder having been made apparent, by the numerous balls of these substances, agglutinated by the mucous of the bowels, and moulded in the cells of the colon, which were voided.

19. ii. Having removed the more urgent symptoms, the *Pathological conditions* producing the tympany requires close attention and appropriate treatment. These conditions are so numerous and so different that it is impossible to state all that may be required to fulfil this intention. This is, however, the less necessary as the circumstances under which tympanites occurs, and the pathological causes producing it, are duly considered, with the treatment required for each, in the articles on *Adynamic Fevers*, inflammations of the *intestines* and of other portions of the intestinal tube, *hysterical affections*, *colic*, *ileus*, and on other disorders upon which tympania is often contingent. The diverse sources of this affection, and the very opposite pathological states which may occasion it, sufficiently explain the success which has sometimes followed ve

ferent or even opposite indications and means of cure. Thus, when depending upon inflammatory action, the antiphlogistic treatment and regimen, as advised by J. P. Frank and others, are then required; but when depending upon a paralysed state of the intestines, consequent upon either organic lesion in some part of the digestive tube, or upon a morbid condition of the blood, as in the advanced stage of low or malignant fevers, then stimulants, tonics, carminatives, and restoratives, as turpentine, camphor, musk, ammoniacum, asafœtida, galbanum, capsicum, myrrh, rue &c., are equally necessary. In these latter circumstances, and especially when the bowels are loaded by offensive sordes, or morbid excretions, then powdered *charcoal*, as advised by Frank, and employed by myself in such cases, in conjunction with antiseptics or other means, or with one or more of those just named, may be employed. The carbon may be administered in doses of half a drachm to a drachm, twice or thrice daily, in the state of powder, in any suitable vehicle. In the case of a very celebrated general, attended some years ago by Dr. F. Hawkins and myself, this substance was administered in that quantity and even in more frequent doses, and was conjoined with active medicines; it having been adopted chiefly for the removal of the fœtor, characterising the evacuations and tympania in the advanced stage of low fever. For inflation of the bowels in the last stage of fevers, in dysentery, in chronic diarrhœa, in misplaced gout, &c., the treatment already advised (§ 17.) is often beneficial; and in many of these, especially in aged subjects, carbon is often of use, and seldom fails of removing the fœtor characterising these cases.

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URINARY BLADDER. — Synon. — *Vesica Urinaria*; *Ves. urinalis*; *κύστις*, *Cystis*; *Urocystis*; — *Vesica*; — *Vessie*, Fr.; — *Harnblase*, Germ.

1. *The Urinary Bladder* is a musculo-membraneous reservoir for the reception of the urine, until the accumulation of a certain quantity solicits the discharge of this secretion. This reservoir is situated in the hypogastric region, between the pubes and rectum in man, and between the pubes and vagina in the female. Its several connections with the urinary and sexual passages, in both sexes, and its other anatomical relations, need not be noticed at this place. It is sufficient that we bear in recollection that, in addition to the disorders and lesions which are seated in it solely or chiefly, it is liable, in consequence of these connections, and of the nervous and vascular communications existing between it and other parts, to several sympathetic affections, the most important of which are those depending upon lesions of the kidneys and ureters, and upon those of the prostate gland and urethra. In all cases, therefore, when the urinary bladder appears to be the seat of disease, our attention should be directed also to the states of these organs and passages; and not be limited to these, but be extended even further, and more especially to the composition and condition of the urine and of its deposits, with the several relations of digestion and assimilation.

2. I. Irritability of the Bladder. — Classif. — II. Class; III. Order. (*See Preface.*)

3. Definit. — *A frequent and urgent desire to micturate, independently of febrile symptoms and of inflammation, and of organic lesion of the urinary bladder and prostate gland.*

4. i. Symptoms. — A person otherwise in good health feels an urgent desire to void his urine after very short intervals, and if the desire be not gratified, either he is incapable of retaining it, or he retains it with great difficulty, and with more or less pain. The effort at micturition is sometimes attended by pain in the glans or under the frænum, and by straining; and although the calls are frequent, the quantity passed at each call is very small. These latter symptoms are most frequent in old or aged persons, and in those who have been addicted to masturbation or sexual excesses, in whom the prostate is more or less tumid or enlarged. Hysterical persons are often liable to this disorder; but in these the urine is more copious and pale, and contains less than the usual proportion of solid ingredients, the nature of which are not altered. When irritability of the bladder has continued long — the organ having for a long period ceased to be distended by the accumulation of urine — the capacity of it becomes permanently accommodated to the paucity of its contents, and incapable of containing more than two or three ounces.

5. Mr. Coulson, in his admirable work on Diseases of the Bladder and Prostate Gland, remarks that, notwithstanding this contracted state, if there be no stricture or disease of the prostate, the parietes of the bladder are often thinner than natural; and that it would seem that protracted irritation produces absorption of part of the substance of the organ. Opportunities of examining after death the bladder of persons who laboured under this affection in its idiopathic form are

very rare. Mr. Coulson examined the body of a gentleman of a very nervous temperament, long a sufferer from this disorder, who was carried off by disease of the lungs; but he could not detect the least alteration in the appearance or structure of the bladder, or of any of the urinary organs.

6. ii. The causes of this disorder require recognition in each case which comes under treatment. Old persons, or the aged, and next the very young, are more liable to irritability of the bladder than youths or the middle-aged; but the causes producing it in the aged are generally very different from those occasioning it in children. The nervous temperament, weak, irritable and anxious dispositions, and gouty and rheumatic persons are most predisposed to it. Those subject to chronic dyspepsia, to nervous giddiness, tremors, or to scaly eruptions, are often also afflicted with this complaint.

When it occurs in females it is sometimes referable to injury from pressure, either during pregnancy or in parturition, or to disorders or lesions of the uterus, ovaria, or vagina. It may be occasioned in both sexes by hæmorrhoids or irritation of the rectum by ascarides, or by chronic states of dysentery. It may occur, in a slight form, even independently of hysteria, in males as well as in females, from self-pollution, or from irritation of the spinal nerves increasing the organic sensibility of the bladder.

7. *a*. The most frequent causes are probably those which are referable to the *states of the urine*, arising either from the nature of the ingesta, or from the changes consequent upon primary or secondary assimilation. It has been well remarked by Dr. Prout, in his celebrated work, that cases of irritable bladder, depending on functional derangement of the kidneys, usually result from the unnatural properties of the urine. All deviations from the normal condition of the urine, whether in deficiency, or in excess or in kind, are recognised by the containing organs, and may prove a source of irritation in the bladder. "Hence, whenever the urine is very dilute or very concentrated, or is preternaturally acid or alkaline, or contains any unnatural ingredient, the urinary organs in general, and the bladder in particular, though perfectly healthy, are liable to become excited and irritable, and the individual has no peace until the unnatural secretion is discharged. In such cases the fault lies, not in the bladder, but remotely in the kidneys and assimilating organs." (*Op. cit.* p. 366.)

8. The use of various fruits, ripe or unripe, especially by children, and even by adults, and disorders of digestion and of assimilation, occasioned by these or by other causes; the elimination from the blood of unwholesome substances, conveyed into it from the organs of digestion, whether subsequently altered or unaltered by the kidneys; the excessive use of alkalis, or of these combined with the vegetable acids, and alkaline states of the urine from these or other causes; and the prolonged use of acids, or of the nitrate of potass, or of the oxide of potassium, or of other diuretics,—may severally occasion this complaint.

9. *b*. The irritation of ascarides in the rectum, and morbid states of the urine, caused either by unwholesome food, by unripe fruit, or by impaired assimilation, or by spinal affections, or by rickets, are the most common causes of this affection *in children*. Mr. Coulson met with cases in children which were caused by so great a contraction of the orifice of the prepuce as hardly to admit the point of a probe; circumcision cured the complaint. When irritability of the bladder occurs in this class of patients about the periods of dentition, it may generally be imputed to disorder of the digestive organs, and to consecutive alterations of the urine. The connection of irritability with paralysis of the bladder is not infrequently met with in children (§ 36).

10. *c*. *Symptomatic irritability* of the bladder is much more common than the idiopathic disease. Granular and other organic lesions of the kidneys are generally attended, especially during the night, with frequent and urgent desire to evacuate urine; this excretion being always more or less morbid even from an early period. Diseases of the prostate gland and of its vicinity, organic, inflammatory, or malignant very generally, and strictures of the urethra not infrequently, are accompanied with this complaint. Indeed, strictly speaking, irritability of the bladder is merely symptomatic, either of disease of some adjoining or some closely related organ, or of morbid conditions of the urine; and this may be the case even in those considered purely nervous, or most devoid of manifest structural change.

11. iii. The diagnosis of this complaint is often of importance; and nothing tends more to determine this than a careful examination of the urine. Irritability of the bladder will not be mistaken for *diabetes*, if the quantity and quality of the urine be ascertained. Although irritability is a symptom of inflammation of this viscus, yet it is necessary to ascertain its independence of inflammatory action; and this is to be inferred chiefly from the absence of those local and constitutional symptoms characterising cystitis, either in an acute or chronic form. The absence of pain in the region of the bladder, and of frequency of pulse or of other febrile symptoms, especially towards evening, will indicate the independence of the recent state of the complaint of acute inflammation; whilst the more chronic state of irritability will not be imputed to chronic inflammation of the bladder, if the constitutional powers of the patient be not very sensibly impaired by it. The dependence of the complaint upon disease of the prostate gland may readily be ascertained by an examination *per rectum*. Not only, however, may there be irritability, but also pain of the bladder, without any manifest disease of this viscus; the mischief being confined to the kidneys, chiefly in the form of calculi of these organs. Instances of this kind are adduced by Morgagni, Prout, Coulson, H. J. Johnson, and others, and have come under my own observation. Dr. Prout remarks that, in certain renal affections in particular habits, even where the urine is not very unnatural, the pain is confined chiefly to the neck of the bladder; but where the urine is actually diseased, and especially when it is alkaline, we may be certain that the kidney is functionally, and if the patient be of a scrofulous habit, and the case of long standing, very probably organically affected.

12. iv. Treatment. — *a*. In recent cases, the states of the general health and of the urine will frequently indicate a successful treatment. When the urine is very acid, or scanty, or furnishes a

red sandy deposit, and when the complaint appears in connection with either gout or rheumatism, then bicarbonate of potash may be given, with or without the nitrate of potash, in tonic or bitter infusions or decoctions; the carbonates of soda and of ammonia being inappropriate, the former owing to its favouring the formation of urate of soda, the latter to its influence in generating urea and uric acid. Mr. Coulson states that great relief will sometimes be obtained from cupping on the perineum. This will be more especially the case if any congestion of, or vascular determination to, the prostate gland be present. Liquor potassæ, prescribed in bitter infusions, with henbane or conium, or with small doses of colchicum, in the gouty or rheumatic diathesis, is also of great service. Where the potash, in either of the states now mentioned, is not productive of relief, magnesia may be given so as to preserve the bowels in an open state, an occasional dose of equal parts of the compound infusions of gentian and senna being also taken.

13. *b.* In cases which manifest a nervous character, or which seem to be results of abuse of the sexual organs, tonics are especially required, either in combinations already mentioned, or with the mineral acids; as the infusion or decoction of cinchona with the nitro-muriatic acids, and with henbane or conium, or with a few drops of tincture of opium, or with the compound tincture of camphor. The mineral acids may also be given with the decoction of pareira brava, or of uva ursi, or with the infusion of buchu, and with the additions just mentioned. I have prescribed the tincture of the muriate of iron in calumba or quassia, and anodynes, with benefit, for cases of this kind. Mr. Coulson remarks, that the decoction of uva ursi and the infusion of wild carrot seeds will occasionally give great relief; but that no medicine is so generally successful in irritability of the bladder as the infusion of diosma; and he adds that, from time immemorial the buchu leaves have been held in great esteem by the natives of the Cape of Good Hope as a remedy for irritative and inflammatory affections of the urethra, bladder, prostate gland, and rectum, and also for rheumatism, indigestion and gravel. The natives of the Cape and the Dutch are partial to the spirit of buchu, made by distilling the leaves in the dregs of wine, and call this spirit buchu brandy; and they use it for all chronic diseases of the stomach and bladder, especially colic, spasms, &c. A tincture of buchu is ordered by the Edinburgh and Dublin Colleges; and half a drachm to a drachm of it may be given for a dose. In these and similar cases of irritability an opiate suppository, or a starch enema containing from one to two drachms of syrup of poppies, or about thirty drops of tincture of opium, may be administered at night; or a pill with opium, or henbane, and extract of colchicum, shortly before bed-time.

14. *c.* When this complaint is *symptomatic* of granular or other organic disease of the Kidneys, or of enlargement or other lesions of the Prostate Gland (see those articles), then the treatment must be based on the primary and chief malady. When it is connected with the gouty or rheumatic diathesis, or with either of the scaly eruptions, then the bicarbonate of potash, or the solution of potash, and small doses of the iodide of potassium, in equal parts of the compound tincture of cinchona, and of the fluid extract of sarsaparilla, with one of the narcotics already mentioned, are often beneficial. If the urine becomes alkaline, or if the iodide appear to perpetuate the irritability, the alkali and the iodide should be relinquished. In this state of the disease, colchicum may be conjoined with the above, or even a small quantity of opium may be added to them. In most cases, especially when the nightly rest of the patient is much disturbed, an opiate in some suitable form should be given in the evening or at bed-time.

15. *d.* When the complaint occurs in *hysterical females*, or in connection with the accession, or with disorder of the catamenia, the preparations of iron, or of valerian, or of asafœtida, or of aloes, the bowels being acted upon by preparations of the latter, are generally beneficial. In these cases also, the tincture of sumbul, in doses of twenty to forty drops, with five or six of the tincture of opium, is often of service.

16. *e.* The incontinence of urine often afflicting *children*, and generally during sleep, seems to proceed from an association of irritability with partial paralysis of the bladder, or at least with impaired tonicity of the sphincter vesicæ. In most of these cases the general health, the digestive functions, and the state of the urine are more or less disordered; and to these especially medical treatment ought to be prescribed. In many instances, while due means are employed for these, stimulating liniments rubbed along the spine, or sponging the back and sacrum with a strong solution of salt night and morning, will prove of service. (*See also* § 39.)

17. *f.* In all cases of irritable bladder the *diet* and *regimen* of the patient should be duly regulated, and with especial regard to the states of the digestive functions, of the urine, and of the organs most intimately related to the offices of the bladder. Fruit and vegetables are often injurious. Much animal food is even more hurtful, especially in the gouty, rheumatic, and uric acid diathesis. Malt liquors and spirits are still more injurious, and wine is very rarely of service. Sexual excesses ought also to be avoided, and sexual intercourse seldom indulged in. The calls to micturate should be deferred as long as possible, and the mind be diverted from it; for a constant response to each early call ultimately gives rise to a habit which increases and becomes confirmed from the want of opposition to it.

18. II. Spasm of the Bladder.—Classif.— II. Class; III. Order. (*See Preface.*)

19. Definit.—*A sudden and violent attack of pain in the region of the bladder, extending along the urethra to the glans, with either involuntary expulsion or retention of the urine.*

20. *A.* This disorder is most commonly *symptomatic*, either of stone in the bladder, or of gonorrhœa, especially when this latter is treated by injections; or of organic disease of the kidneys, or of parts adjoining the bladder. Dr. Prout remarks that it may be caused by acid urine, by abscess of the kidney, by ulceration or other disease of the prostate gland, bladder, &c., or by retention of urine, or by gout, or by venereal excesses. Irritating diuretics, cantharides taken internally, the application of blisters, hysteria, masturbation, the irritation of ascarides in the

rectum, dysentery, or tenesmus may severally excite an attack. When it is connected with gonorrhœa or the treatment of it, then the sphincter vesicæ is thereby either irritated or inflamed, and spasm supervenes as soon as urine passes into the bladder.

21. *B.* The sudden and violent attack of pain in this viscus, *characterising* this complaint, is attended by a constant desire to void urine, without the ability to do so, and the agony felt during these attacks is excessive. The contraction of the bladder excites the muscular coats of the rectum, and occasions also a desire to evacuate the bowels, or more or less tenesmus. Mr. Coulson remarks that the closure of the ureters at their vesical extremities has given rise to dilatation of these ducts and of the pelices of the kidneys, and to serious changes in the kidneys; and that, after an attack of spasm, from which the patient has apparently recovered, it sometimes happens that a new train of symptoms appears, indicating the injury which the tubular and secreting structure of the kidneys has received. Frequent attacks of spasm also sometimes injure the tone and contractility of the bladder so much as ultimately to induce a partial or more complete paralysis of the organ (§ 27.).

22. *C.* The *diagnosis* of spasm of the bladder is not difficult; it may, however, be confounded with inflammation; but in this latter the pain is constant, commences with uneasiness, and gradually becomes more and more severe. Spasm occurs suddenly; the pain is violent and constrictive; whereas in inflammation the pain, when greatest, is either lancinating or throbbing, and is attended by more or less febrile action, of which the former is generally exempt. In both the urine is usually retained, or passed in the latter in very small quantities, and after remarkably short intervals. Spasm may, however, be associated with inflammation of the mucous coat of the bladder, as spasm of the coats of the colon is associated with inflammation of the mucous coat of the intestine. In such cases the spasm is only a symptom aggravating the character of the inflammation, febrile symptoms more or less manifestly attending this latter.

23. *D. The treatment* of spasm of the bladder will appear from the above to depend chiefly upon the pathological state occasioning it. If it be consequent upon inflammatory action, either of the sphincter vesicæ, upon suppressed gonorrhœal discharge, upon the use of irritating injections, or upon inflammation of the bladder, *bleeding*, according to the grade of morbid action and habit of body of the patient, should be prescribed, either by venesection, cupping, or by leeches, and be repeated if required. The warm bath, fomentations, cooling aperients, and diaphoretics should follow vascular depletion; and demulcents with anodynes, emollient enemata with anodynes or narcotics, &c., should also be prescribed. If the complaint supervene on gonorrhœa or the use of injections, the above treatment is appropriate; local bleeding, however, generally proving sufficient.

24. If spasm of the bladder occur in the gouty diathesis, or upon the suppression of a paroxysm of gout, or as misplaced gout, the regular form of the disease should be solicited by means of mustard pediluvia, and mustard poultices to the feet, whilst the soothing and anodyne remedies above mentioned are exhibited. In cases of this kind, as well as in many others, magnesia and sulphur may be taken, with small doses of colchicum, of camphor, and of opium; and if the former be given in decided doses so as to act upon the bowels, a more rapid effect will be produced upon the spasm than by any other means. If the state of the urine occasion or aggravate the spasm, appropriate means should be used to correct this state.

25. When the disease is symptomatic of a calculus in the bladder, or in the kidney, or passing the ureter, the warm bath, fomentations, demulcents, emollients, and narcotics, or anodynes, taken by the mouth and administered in enemata, are generally of service; but when the calculus is in the bladder these means are only of temporary benefit,—permanent relief must be looked for only from the surgeon. Cases of spasm affecting chiefly the sphincter vesicæ, and causing retention of urine, are generally symptomatic of irritation or of disease of adjoining parts, and are relieved by the tinctura ferri sesquichloridi taken in doses of ten to twenty drops in water every quarter of an hour, or by a suppository containing the extract of belladonna, or by a belladonna plaster applied over the perineum, whilst the emollients and anodynes already advised are taken internally. Mr. Coulson recommends a poultice containing powdered camphor to be applied over the perineum, or a liniment composed of camphor and opium; and states that emollient clysters containing some of the watery extract of opium often afford instant relief.

26. III. Paralysis of the Bladder.—Classif.—I. Class; II. Order. (*See Preface.*)

27. Definit. — *Partial or complete loss of the contractible power, and of the organic sensibility, of the bladder; often also with loss of power of the abdominal muscles, whereby the urine is partially or completely retained.*

28. i. History. — Paralysis of the bladder, whether partial or complete, whether temporary or permanent, depends on loss of power, either originating in the organ itself, or affecting it consecutively upon injury or disease of the spinal chord, or of the brain, or of their membranes —*a.* A *partial* form of paralysis sometimes occurs as a symptom of extreme debility or exhaustion in the course of acute or chronic maladies, as of typhoid or adynamic fevers, of hectic, and of the last stage or organic diseases. In these circumstances, the contractility and organic sensibility of the bladder is more or less impaired, and the power of the abdominal muscles to aid by their contraction the expulsive efforts of the detrusor urinæ, is equally lost.

29. *b.* In some cases the loss of power in both is *general* and *complete*, and this state of the disease, especially in its advanced or protracted form, may be attended by a constant dribbling of the urine, owing to the over-distension of the bladder having overcome the resistance of the neck or sphincter vesicæ. Thus incontinence of urine is superadded to retention, and the latter is sometimes mistaken for the former. In such cases examination of the abdomen and region of the bladder, or the introduction of a catheter, will disclose the state of matters; and strict attention should be paid to the excreting functions of the urinary organs in all fevers and constitutional maladies.

30. *c.* Paralysis of the bladder, giving rise to retention, may come on gradually, especially in advanced age; either in consequence of disease of the kidneys, or of the prostate or urethra, or after a prolonged neglect of evacuating the bladder or the suppression of the desire to evacuate. In these circumstances, however, the paralysis and the retention may be at once complete. Although this form of the affection is most frequent in aged persons suffering from disease of some other parts of the urinary apparatus, yet it may also affect the middle-aged, especially when the desire of evacuation has been long suppressed; the consequent over-distension having overcome the power of contraction, the abdominal muscles either failing to expel the urine, or expelling it only partially. In these and similar circumstances a frequent desire to micturate occurs, and after expulsive efforts made by the abdominal muscles a very small quantity only is expelled; and this state may be mistaken for a form of irritability of the bladder; but, upon a strict examination of the abdomen, or upon the introduction of a catheter, a large accumulation of urine is found in the viscus.

31. In some persons, even of middle age, a more or less manifest state of paralysis is consequent upon impaired health caused by anxiety, fatigue, excessive application to business and neglect of calls to micturate, or by venereal excesses or masturbation. When these latter causes have existed, a state of complete or incomplete *tabes dorsalis* supervenes, with manifest weakness of the loins and lower limbs; and if relief be not obtained, paraplegia, with complete paralysis of the bladder, ultimately results. In both this and the immediately preceding cases, as well as in some others, the over-distension of the bladder, or the distension of it to a certain extent, occasions a frequent desire or effort to evacuate the urine, and a small quantity only is passed, the power of contracting further being lost, or the contractions of the abdominal muscles being sufficient only to expel that small quantity. In such cases the catheter is often required.

32. *d. Injuries* and *diseases* of the *spinal chord* and *brain*, and their *membranes*, occasion the most complete and severe instances of paralysis of the bladder; more especially lesions seated in the spinal chord or its membranes, and whether in the cervical, dorsal, or lumbar regions. In this class of cases the effects produced upon the bladder and upon the state of the urine are different, or vary more or less with the amount of injury or disease, or with the rapidity of progress of the latter in the nervous centres; but they are generally remarkable according to the severity or danger of either. At first, or immediately after the occurrence of these, the urine may be more or less acid and free from mucus; but especially after injury of the spinal chord it soon becomes alkaline, turbid, and ammoniacal, evincing this state at its discharge; and when it cools it deposits much adhesive mucus. After a short time phosphate of lime is found in the mucus, which afterwards is sometimes blended with blood. The urine collected in the bladder is altered, either during the process of secretion, or during its retention in the bladder; and is generally changed in the following manner. The urea is converted into carbonate of ammonia, which irritates the mucous surface of the bladder and causes the exudation of much viscid mucus. The neutral triple phosphate of magnesia and ammonia contained in the secretion form prismatic crystals, and present different degrees of transparency. The inflammation of the bladder consequent upon paralysis of the bladder, caused either by injuries or disease of the nervous centres, extends from the mucous to the other coats of the organ, if the patient live for some time; and the parietes become thickened and incapable of contraction; the urine requiring to be drawn off, and always presenting a fœtid and alkaline character. The question in these cases is whether the change in the urine is owing to the altered nervous power of the kidneys, or is it the result of retention in the bladder? From some attention which I have paid to this question I conclude that the change in the urine takes place primarily and chiefly in the kidneys, owing to the loss of that portion of nervous power which the spinal nerves convey to the renal ganglia; and that it is increased during the retention of the urine in the bladder, the paralysed state rendering this viscus more prone to inflammation, and to the more rapid supervention and progress of the changes consequent upon inflammation.

33. As this state of disease proceeds, the pain or uneasiness of the neck of the bladder and glans penis at first experienced subside and ultimately disappear, although distension may continue or encrease. The desire to pass urine is not expressed; and whilst the local symptoms subside the constitutional become aggravated. The pulse is much accelerated, thirst is increased, and restlessness and anxiety of mind are augmented. The fur on the tongue is thicker, deeper, and darker coloured. Delirium supervenes, with a urinous odour of the perspiration, and stupor or profound coma supervenes, and the patient dies in this state; the complaint being, perhaps, mistaken for typhus fever, if due attention have not been directed to the states of the urinary functions and bladder. Patients, especially those advanced in life, when attacked by fever, owing to the congested states of the nervous centres, may experience similar changes in the urine, and a similar paralysis of the bladder; and if this unfavourable complication of fever be overlooked, it rarely fails of being the chief cause of a fatal issue.

34. Paralysis of the bladder occurs chiefly in the aged; and although in them, as well as in some younger persons, it may be favoured or caused by the states of the spinal chord or of its membranes, it is most frequently consequent upon disease of the prostate gland or neck of the bladder, or of the urethra, causing over-distension of the organ. When this complaint affects females, especially from puberty to the decline of life, it is generally connected with *hysteria*, or with the advanced stage of spinal congestion (hysterical paraplegia) caused by uterine irritation. I have seen several cases of hysterical paraplegia, where a surgeon was required to draw off the urine, the complaint having been imputed to masturbation. When it occurs in married females it may be either a symptom of pregnancy, or of injury experienced during labour or delivery. In the fourth month of pregnancy, or about that time, or near the period of confinement, retention of urine may occur, and if it be neglected a paralysed state of the bladder may supervene from distension.

Similar results may follow retroversion or anteversion, or prolapsus of the uterus. Imperforate hymen, and obstructed catamenia from this cause have even occasioned this complaint.

35. *e. Hysterical paralysis* of the bladder is believed by Sir B. C. BRODIE, and very justly in many cases, to be owing to defective efforts of volition. He remarks that, in the first instance, it is not that the nerves are rendered incapable of conveying the stimulus of volition, but that the effort of volition is itself wanting; and this corresponds with what is observed in other affections connected with hysteria. "As the distension increases the patient begins to be uneasy, and at last suffers actual pain; and as soon as this happens volition is exercised as usual, and the bladder begins to expel its contents." If not relieved by means the catheter, the hysterical retention of urine is thus of short duration; but if the catheter be had recourse to, the natural cure is prevented, and the disease may be indefinitely prolonged. "The general rule." Sir B. BRODIE adds, "in the treatment of these cases, is to interfere but little;" but this rule is not without exceptions; for, in a few cases where the bladder has been very much distended, it loses its power of contraction, and even though the patient endeavours to micturate, no water flows. Under these circumstances, artificial aid should be obtained.

36. *f.* The affection which sometimes occurs in *children*, especially in delicate boys, and which is characterised by the discharge of urine during sleep, has been variously explained: by some it has been imputed to irritability of the bladder, by others to a morbid state of the urine, causing irritation of this viscus and by some to paralysis of the neck of the bladder, occurring during sleep. That this last condition may obtain is not unlikely, as the affection is not infrequently associated with prolapsus of the rectum after a motion, and with deficient tonic contraction of the sphincter ani. It may, however, depend, in different cases, upon the association of all these morbid conditions in different degrees, the share that a morbid state of the urine may have in its production being ascertained by the examination of this excretion.

37. ii. THE TREATMENT of paralysis of the bladder, is 1st, *constitutional*, and 2nd, *local*; but, in many cases, the latter should precede the former, especially as respects the urgent necessity of obtaining immediate relief As to the best means of attaining this end I must refer to surgical writers and especially to the able and precise instructions of Mr. COULSON, in his work on the "*Diseases of the Bladder*," &c.—*A.* The *constitutional treatment* must chiefly depend upon the nature of individual cases, upon the pathological conditions occasioning this disease; but in most cases, and particularly in old cases, medical treatment is of little avail; surgical appliances, especially frequent introductions of the catheter, being required during the life of the patient. Trial, however, may be made of strychnine, gradually increasing the dose, and carefully observing its effects on the nervous and muscular systems. I have generally preferred the extract of nux vomica, in doses of a quarter of a grain, gradually increased to one grain, given twice or thrice daily, and combined with the aloes and myrrh pill, and purified extract of ox-gall, or with the compound galbanum pill. I have also prescribed terebinthinate embrocations, or epithems, to be applied over the loins and sacrum. In the great majority of cases, and especially in aged persons, serious lesions supervene in the kidneys and in the pelvis of these organs, and thus complicate and further aggravate the disease, and render recovery altogether hopeless.

38. *B. Hysterical paralysis* of the bladder is not infrequently caused by masturbation, and a moral discipline is required, although it may not prudently be either suggested or enforced, unless with the utmost discretion. Indulgence and sympathy, on the part either of friends or of the physician, should be withheld, and the most nauseous anti hysterical medicines should be exhibited, especially asafœtida, turpentine, &c., both by the mouth and in enemata. In a case where this affection was rather simulated or feigned, than actually present, I recommended, in the hearing of the patient, the actual cautery to be applied to the sacrum; but the complaint vanished soon after mention was made of the remedy, and directions given as to its employment.

39. *C.* The *paralysed* or *relaxed state* of the neck of the bladder in children, noticed above (§ 36. generally disappears as the constitutional powers of the patient improve. I have found tonics, stomachic aperients, chalybeates, and stimulating embrocations applied over the loins, the spine and sacrum being sponged every morning with a strong solution of salt, of great service. The patient should sleep on a hair mattrass covered with a waterproof cloth. Change of air, sea bathing, or sponging with sea or salt water, where the plunge bath causes alarm, and exercise in the open air, are also beneficial indeed are almost essential in these cases.

IV. INFLAMMATION OF THE URINARY BLADDER. — SYNON. — *Cystitis*, (from *Cystis*, a cyst or bladder), Sauvages, Vogel, Cullen, &c.;—*Inflammatio vesicæ*, Sennert, Hoffmann;—*Cauma Cystitis*, Young;—*Empresma Cystitis*. Good;—*Uro-cystitis*, *Cystiphlogosis*;—*Inflammation de la Vessie*, Fr.;—*Entzündung der harnblase*, *blasenentzündung*, Germ.

CLASSIF.—1. *Class*, 2. *Order* (Cullen);—3. *Class*, 2. *Order* (Good);—III. CLASS, I. ORDER (*Author, in Preface*).

DEFINIT.—*A sense of pain in the region of the urinary bladder, increased on pressure, with a frequent desire to micturate, generally preceded by chills or rigors, and attended by inflammatory fever.*

40. i. STRUCTURES AND PARTS PRIMARILY OR CHIEFLY AFFECTED.—Inflammation of the bladder most frequently commences in the mucous coat, to which it may be limited, or it may extend to the external coats. When it thus commences it may be circumscribed, or it may affect all this coat. When the former obtains, the part covering the neck of the bladder and the cystic triangle is most commonly affected; but inflammation, whether limited to the mucous surface or affecting the other coats also, or even the whole parietes of the organ, generally commences in this situation, owing to the irritation of sabulous matter, of calculi, &c. The imperfect emptying of the bladder, especially in connection with engorgement of the prostate, the contiguity of this

part to the prostate and urethra, the liability of the extension of inflammation to it from these parts, and the participation in irritation of the rectum and vagina, also account for the more frequent commencement of cystitis in this part. From the extension of disease, cystitis may be consecutive upon inflammation of the rectum or vagina, upon metritis, and upon hæmorrhoids; and it is often consequent upon and complicated with inflammation of the prostate. In addition to these modes of commencement, cystitis may primarily attack the peritoneal covering of the fundus. This is comparatively a rare occurrence. The fundus of the organ is much less frequently the seat of the disease, particularly at an early stage, than the neck of the bladder and the parts situated posteriorly between the sphincter and entrance of the ducts. When inflammation commences in the peritoneal coat of the organ it usually arises from the extension of the morbid action from adjoining parts, as the rectum, cæcum, colon, or omentum. Uro-cystitis has thus been observed in the course of colonitis or inflammatory dysentery, of peritonitis, and of inflammation of the generative organs in females; and the connection of these maladies has often been rendered manifest by examinations after death. Inflammation may also attack all the coats of the bladder either primarily or consecutively. The former is of rare occurrence, the latter is much more frequent, owing to its extension from the mucous or serous surface of the organ, and to injuries and operations.

41. Uro-cystitis, with reference to its *seat*, may be viewed,— 1st. As to its limitation to the mucous surface of the organ; 2nd. As to its extension to the coats forming the parietes; 3rd. As to the part of the viscus most frequently affected either primarily or secondarily; 4th. As to the nature of the morbid action; 5th. As to its consequences; and, 6th. As to its complications. Each of these heads will be considered in detail.

ii. Inflammation of the Mucous Surface of the Bladder. —Synon. — *Blennorrhagia vesicalis*, Swediaur; — *Dysuria mucosa*, Cullen; — *Catarrhus vesicæ*, Lieutaud; — *Rheuma vesicæ*, Stoll; — *Pyuria mucosa*, Sauvages; —*Catarrhe de la vessie*, Fr.; — *Muco-cystitis* (*Author*).

42. Inflammation of the mucous coat of the bladder generally proceeds from the common causes of inflammation, and from those which are usually productive of cystitis (§§ 84 *et seq*), especially the extension of inflammation of the urethra to the neck and internal surface of the organ, the use of irritating injections, of irritating diuretics and aphrodisiacs, the irritation of calculi, &c. This form of cystitis is of frequent occurrence, and presents every degree of activity from the most acute to the most chronic, owing to the diathesis and habit of body, age, and mode of living of the patient, and to its causes.

43. *A. The acute form* of the disease is characterised by severe pain, increased by pressure, sense of heat or tension in the hypogastric region, and uneasiness in the perineum, and by frequent urgent calls to discharge the urine, attended by difficulty and increased pain. These symptoms are often preceded by chills, horripilations, or rigors, and are followed and attended by febrile reaction and its usual concomitants. Sometimes neither chills nor horripilations are felt, especially when the disease has extended from the prostate gland or the urethra, the pain in the region of the bladder, and the frequent desire to urinate being the invading symptoms. The urine is passed often and in small quantities, with much smarting heat and repeated efforts. It is generally acid. of a deep lemon or orange colour; at first clear, but in a day or two numerous small shreds of lymph or mucus are seen floating in it. Sometimes the urine is reddened and turbid, and deposits a thick sediment, consisting chiefly of a muco-puriform matter. In a few days the irritation and febrile disturbance are diminished; the severity of the pain in the region of the bladder is abated; but often, even when this abatement is well marked, the quantity of mucus or of muco-puriform matter in the urine is increased. The local and symptomatic irritation, and the frequency and the difficulty of urinating, generally more or less subside about the same time.

44. *B. The consequences and terminations* of acute muco-cystitis vary with the severity, the causes, and the nature of the attack, and the constitution and other circumstances of the patient. If the inflammation proceed no further than the mucous surface of the neck of the bladder and of the parts in the immediate vicinity, the above symptoms diminish gradually, and the disease terminates in resolution. But very different consequences occasionally ensue. If the inflammation be very acute, it may rapidly extend to all the tissues of the organ, and even partially to others in the vicinity, the disease becoming extremely dangerous or even fatal. In this case it passes into a state of uro-cystitis, to be noticed hereafter. More frequently, however, the acute inflammatory symptoms gradually subside, especially the febrile action, but the local ailment subsists for some time, or continues with greater obstinacy, the disease becoming chronic.

45. *C. Chronic inflammation of the mucous surface of the bladder* sometimes supervenes on the acute, as just stated; but it often occurs in a primary form.—*a.* In this latter case its invasion is slow, and it is not accompanied with any or much febrile disturbance, unless the inflammation assume an intermediate grade between the acute and chronic. Sometimes the febrile action is very slight or remittent, and the local symptoms are chiefly remarkable, especially irritability of the bladder, pains in its region, or at the extremity of the urethra, previous to and at the time of passing the urine. This excretion furnishes, especially as it cools, a mucous or muco-fibrinous deposit, of various shades of colour in different cases, and often an ammoniacal odour. A sense of weight in the perineum, or of heat in the bladder and along the urethra, frequent calls to micturate and shooting pains to the anus are also often experienced. The discharge of mucus in the urine is more or less considerable,— hence the term *catarrhus vesicæ*,— but varies much in different cases and at different times.

46. *a.* Sometimes the disease is slight; but in old cachectic subjects, and when complicated with disease of the kidneys or of the prostate, or with both, it is often dangerous, or even proves fatal. In this latter state, or when the disease has gone on to ulceration, the heat in the bladder and urethra amounts to scalding, the desire to pass the

urine becomes more frequent and urgent, and the efforts more violent or straining. The expulsion of the last portion of urine is more or less painful; and retention of urine is not infrequent, owing to the obstruction caused by clots of mucus or fibrinous exudation lodged in the passage. Pain is felt at the extremity of the penis, in the perineum and anus, sometimes in the loins and thighs. There are thirst, costiveness, or irregularity of the bowels, uneasiness or restlessness, wasting of flesh, and loss of strength.

47. *b.* The *mucus* discharged in the urine varies much in quantity and appearance. It is sometimes small, at other times or cases it is so great as to amount to pounds in the twenty-four hours. In small quantity the urine is rendered turbid or flaky by it, and it settles to the bottom of the vessel. It is occasionally stringy, ropy, or of a lumpy or viscid consistence. The urine is generally acid early in the disease, but it becomes neutral or alkaline as the mucous secretion is increased. When acute muco-cystitis passes into the chronic the quantity of mucus is often considerable; in some cases extremely great, forming glairy or ropy streaks in the urine, which are afterwards deposited. When the disease has not been of long duration the mucus in the urine is generally whitish-grey or yellowish-grey, tenacious or stringy, inodorous, and presenting no distinct appearance of pus. But in the more chronic or obstinate cases a purulent matter is evidently present, mixed with, and often more or less predominating over the mucus. In these cases the morbid matter is less abundant, less tenacious, of a yellowish colour, more readily miscible with the urine, and is sometimes streaked with thin bloody filaments. It is also sometimes fœtid, is not so readily deposited at the bottom of the vessel as the mucous secretion, nor is it so tenacious. It does not form albuminous flocculi when boiling water is poured upon it, nor does it coagulate, or but imperfectly, when boiled. When these appearances are seen in cases of considerable duration, ulceration of the mucous surface, affecting chiefly the follicles, and the extension of inflammation to the connecting cellular tissue may be inferred. This inference will be still more fully borne out if there be slight fever assuming a remittent or intermittent or hectic form, constant pain in the organ, emaciation, restlessness at night, and the undoubted presence of pus in the urine, with more or less alkalescence.

48. *c. Pus* may be distinguished from mucus not only by the above appearances, but by its being miscible with the urine, which it renders opaque. If the urine contain pus as well as mucus, the former is deposited upon the latter, and is yellower in tint, and opaque, the mucus being translucent. The microscope aids the diagnosis in these cases, by showing the presence of pus-globules of the diameter of $\frac{1}{2000}$ of an inch. If the urine be acid the nucleus of the pus-globule may be seen without the aid of re agents; but, as it is more frequently alkaline, the addition of a drop of acetic acid will bring the nucleus into view by rendering the corpuscle more transparent. A copious sediment resembling pus is sometimes produced by a large quantity of triple phosphate in the urine. But the nature of this is shown by its solution in nitric acid, and by the shape of the crystals under the microscope. When the urine containing pus presents an acid reaction, pyelitis may generally be inferred; when it is alkaline cystitis may be considered to exist. Purulent urine becomes clear on standing; a more or less abundant sediment is formed; the supernatant fluid is often of a greenish-yellow tint, and contains albumen.

49. Dr. PROUT states, that in the advanced stage of the disease the mucus in the urine is diminished, it becomes opalescent and of a greenish tint, and can in part be easily diffused through the urine, rendering it glairy or opaque, or milky like pus, the morbid matter being in fact muco-puriform. The urine is now generally deep coloured, or serous, or alkalescent, having an ammoniacal odour and effervescing with an acid. In this latter case there is an excess of carbonate of potash or of soda in the urine, derived from the serum of the blood. "When these symptoms have continued for a longer or shorter period, the urine becomes scanty, still more high coloured, and occasionally even acid; the mucus and even the pus gradually diminish, and almost disappear; and after a short period of comparative ease the patient expires."

50. *d. Intermediate grades* of muco-cystitis, between the acute and chronic states of the disease, are occasionally met with in practice. These have often been termed *sub-acute*. They are to be distinguished by more or less of the symptoms already adduced; generally all of them, but in different degrees of severity, and attended by remittent or hectic febrile action. They may occur primarily or follow the acute, which may subside into the sub-acute and ultimately into the chronic state, terminating at last in ulceration and thickening of the organ, or some other structural lesion. The chronic form of the disease may even pass into the acute, although not so often as the converse, either having presented an intermediate grade of morbid action, or having, owing to some exciting cause, suddenly assumed the acute form. In this latter case the extension of inflammation still further should be dreaded and guarded against.

51. *e.* The *duration* of muco-cystitis is extremely various: it may be from one month—it being seldom much less in the acute—to two or three months in the sub acute, to several months to two or three years in the chronic. It depends entirely on the cause, the age, and constitution of the patient, on the degree to which the inflammation may have extended to the other coats of the viscus and to adjoining parts, and on the complications the disease may have presented. The same circumstances also influence the prognosis and treatment (§§ 83. 89.).

iii. INFLAMMATION OF ALL THE COATS OF THE BLADDER. — *Cystite profonde*, CLOQUET;— *Cystitis vera — true Cystitis.*

52. This form of cystitis is not often met with as a primary disease. It much more frequently supervenes on one or other of the forms of muco-cystitis, and it occasionally occurs from the extension of inflammation from contiguous viscera; as from inflammation of the uterus and ovaria or Fallopian tubes, or of the rectum, colon, cæcum, peritoneum, omentum, &c.; from extensive hæmorrhoids, and from disease of the prostate. It will be seen that true cystitis, in some of these consecutive states of occurrence, commences in

the peritoneal surface of the fundus, and that it extends to all the coats. It is indeed extremely rare for true crystitis to commence in this part of the structure of the bladder, unless when it supervenes in the manner now alluded to.

53. *True Cystitis* is thus more frequently secondary or consecutive, and but rarely primary. But, whether originating in the one way or in the other, it is a severe and dangerous disease; and, owing to its consequences, is often speedily followed by the most serious effects. While the mucous coat only is the seat of inflammation the functions of the muscular coat is seldom affected in such a manner as to allow inordinate accumulations of urine within the viscus, unless the disease is attended by an obstruction to the discharge of the urine by associated disease of the prostate or urethra, or by the impaction of a calculus or fibrinous clot in the neck of the bladder. When, however, these obstructions occur, the inflammation of the mucous coat soon extends to the other coats; the previous irritability of the muscular coat is overcome by the distension consequent on obstruction; and rapidly passes into almost total paralysis or incapability of contraction, one of the most dangerous states of the organ in cystitis.

54. When true cystitis follows muco-cystitis or catarrhus vesicæ, the abundant mucous or muco-purulent secretion which characterised the latter is either much diminished or ceases altogether. This arises from the transfer of the inflammatory action chiefly to the more external coats of the bladder, and the diminution of it in the surface, which was formerly its only seat. The occurrence of this change has led Dr. PROUT to think that the inflammation of all the coats of the viscus is of a different kind from that of the mucous coat; but I infer that the difference consists merely in the different functions of the parts affected in both these forms of cystitis.

55. *True Cystitis* presents various grades of activity, from the most acute to the chronic. The pathological states through which the disease passes, and the consequences to which they lead are also diverse, and not always referable to the violence of the attack; but are dependent upon a number of circumstances connected with the causes, complication, and other peculiarities of the case. Thickening of the coats of the bladder, owing to an infiltration of an albuminous serum into the connecting cellular tissue, is very frequent, especially when the inflammation is sub-acute or chronic, or has extended from the mucous coat and is dependent upon obstruction to the discharge of urine or the presence of calculi. In these cases the distension of the bladder is a frequent occurrence; and even when this form of the disease is primary, and is not accompanied with obstruction to the discharge of urine, a loss of the power of the muscular coat, and consequent retention of urine, is a frequent attendant upon it. Although true cystitis affects all the coats of the bladder, a part of the organ may be more particularly affected by it than the rest, especially the parts near the neck, and extending thence to the ureters. This is especially the case when the disease has followed inflammation or other morbid states of the prostate gland, urethra, rectum; or has proceeded from hæmorrhoids, or from injuries caused by the use of the catheter, by lithotomy, lithotrity, or other operations.

56. *A. Acute Cystitis.*—*a.* The *symptoms* of this state of the disease are, generally after chills or rigors, severe pain, at first behind, afterwards above the pubes, a sense of uneasiness in the perineum, heat and tenesmus, and heat and smarting in the course of the urethra. The patient has frequent calls to pass urine, which are always attended by more or less difficulty, often amounting to dysuria. The urine at last escapes only by drops, with more or less scalding and pain, and ultimately with unavailing efforts to discharge it. When the symptoms arrive at this pitch much anxiety and tension of the abdomen are experienced. The distended bladder rises above the pubes, and the hypogastric region is very tender. The frequent calls to pass the urine and the dysuria may mislead the physician, a large quantity of water accumulating and causing injurious distension of the bladder before the circumstance is suspected. This accumulation may be explained by the irritable state of the sphincter vesicæ, the tumefaction of the inflamed parts having diminished the outlet of the bladder, and by the want of due action in the muscular coat, owing to the inflammation in which it and the other coats are involved. Hence it is thrown into frequent and inefficient action, a portion of urine is often passed, but, as soon as it reaches the irritable and inflamed parts immediately below the sphincter, spasm of these parts, and of the sphincter itself, takes place, which the contractions of the fundus are unable to overcome. The secretion of urine proceeding, distension so great as to destroy the powers of reaction results, and complete paralysis of the muscular coat supervenes. If in this state a portion of the urine pass off, it is owing to partial relaxation of the sphincter for a moment, and to the position admitting of the discharge by gravitation. This difficulty of voiding the urine and the consequent accumulation are not owing to the muscular coat of the bladder only, for in many cases the parts near the neck of the bladder are chiefly affected; the tumefaction of these being so great as nearly to obliterate the canal, and mechanically to obstruct the flow of urine and the introduction of the catheter. In complications of the disease, with enlarged or inflamed prostate, this is obviously the case; a circumstance tending materially to influence the prognosis. Independently of this complication there is every reason to infer, from the nature of the morbid secretion and structure of the parts, that this swelling contributes its share with the other lesions to the production of this very unfavourable symptom. In cases of cystitis produced by injuries of the spine the paralytic state of the muscular parts of the bladder is the cause of the accumulation of urine and of the consecutive inflammation; but in other cases the inflammation is the cause of the retention and of the loss of muscular power, as above stated.

57. When the disease has reached this stage, and the accumulation in the bladder is manifest, the symptoms soon run on to a dangerous height, if relief be not soon afforded by medical or surgical treatment. The patient is anxious, distressed, and fevered; the pulse is very frequent and hard; the tongue white and loaded; the appetite is lost; thirst is great; costiveness with frequent calls to stool, painful tenesmus, and difficulty of passing a motion, especially when the

disease is seated chiefly about the neck of the bladder, or is complicated with disease of the bladder, as frequently is the case, especially in old men, are also experienced. In these cases, and in others proceeding from some irritation acting in a special manner on the bladder, as when the cystitis has arisen from the improper use of cantharides, the presence of calculi, &c., the urine which is passed is often sanguineous, or contains a considerable quantity of blood.

58. The disease, having reached the state now described, will often evince signs of diminution, or rapidly present those of a still more dangerous character. If accumulation of urine and over-distension of the bladder have been prevented, and the treatment otherwise judicious, the former will generally be the result. But when the bladder still continues over-distended, great prostration of strength, with extreme restlessness, takes place; the pulse becomes small, frequent, intermittent, constricted, and at last weak and scarcely perceptible; the skin is hot and dry, afterwards moistened with a urinous or fœtid perspiration; the tongue is dry, the thirst extreme; and to these sometimes supervene cardialgia, vomiting, hiccup, stupor or low delirium, cold extremities, sometimes convulsions, coma, and death.

59. *b.* Cases of true cystitis occasionally occur wherein little or no urine accumulates in the bladder, owing to the inflammation and consequent tumefaction of that part of the viscus surrounding or in the vicinity of the opening of the ureters into it, or to the effusion of coagulable lymph having entirely shut up their outlets. In these cases inordinate distension of the ducts and pelvis of the kidneys must occur, and, in addition to the above symptoms, those of dangerous disease of the kidneys and suppression of urine supervene; especially fulness, pain, and tenderness in the loins, numbness of the limbs, vomiting, constant hiccup, cold or urinous perspirations, rigors, subsultus tendinum, coma, &c.

60. *c.* When cystitis has followed the healing of old eruptions or ulcers, or the sudden stoppage of accustomed discharges, as the hæmorrhoids, the catamenia, or fluor albus, or if it have arisen from the misplacement or metastasis of rheumatism or gout, or if it have attacked persons of these diatheses, the several tissues of the bladder are liable to be affected nearly at the same time; but the symptoms are generally less severe than in the strictly primary and phlogistic form of the disease, and more frequently assume a sub-acute form, or some grade intermediate between this and the chronic form next to be described.

61. *d.* The *duration* of the disease in persons of the phlogistic diathesis, and at an early age, often is extremely short. True cystitis may reach its height as early as the third or fourth day, and its termination in the course of the first or second week. But in more delicate or less inflammatory constitutions, or in those weakened by previous disease, if it assume the acute form, it is more inclined to lapse into a sub-acute or chronic state, and to continue an indefinite time. It may, moreover, assume from the commencement a sub-acute or intermediate character between the acute and chronic. But in all cases of this form of cystitis very much depends upon the nature of the exciting and concurring causes, the complications which certain cases present, and the attention paid to the unloading the bladder of its contents, and to other indications and means of cure.

62. *c. Terminations of Acute Cystitis.*—True cystitis terminates—1st. In resolution, with a gradual amelioration of all the symptoms; 2nd. In the chronic state, with relief of the most urgent symptoms, and continuance of a dull pain, uneasiness, and tenderness in the region of the bladder, dysuria, &c. (§ 65 *et seq.*); 3rd. In suppuration, when the disease is very acute, this issue generally occurring within twenty-four hours after the disease has reached its acme; 4th., and very rarely, in gangrene; 5th., and still more rarely, in rupture of the viscus.

63. (*a*). *Suppuration* is preceded and attended by pain and throbbing in the region of the bladder or behind and above the pubes, and occasionally referred to the seat of the rectum; by horripilations, chills, or rigors, followed by flushes of heat, and sometimes by perspiration. There are often also painful tenesmus, costiveness, and fever. The urine afterwards has a turbid purulent appearance, or contains a whitish-yellow matter, sometimes streaked with blood, and has the odour characteristic of pus. In many of these cases the purulent secretion proceeds from the internal surface of the bladder; but small abscesses formed in the parietes of the viscus have opened internally and furnished this secretion. This latter is more frequently the case when the parts near the neck of the organ are more especially affected. CHOPART has recorded several instances of this occurrence, as well as of another, more unfavourable, when the abscess is formed more exteriorly, and makes its way externally to the bladder, into the loose adipose cellular tissue at the bottom of the pelvis. If, in such cases, the patient survives, the abscess ultimately points in the perineum, or near the margin of the anus Abscess of the bladder is seldom so situated as to break into the peritoneal cavity. In all cases of abscess of this viscus the danger is great, particularly in the latter cases.

64. (*b*) *Gangrene* may supervene in the most acute cases, or in cachectic constitutions; but it is a very rare occurrence, and is never met with unless the disease be attended by retention of urine of two or three days' duration. In these circumstances an eschar or small sphacelated spot is formed at one or more situations in the organ. This advances, and at last the bladder bursts and the urine is effused, generally into the abdominal cavity. M. CLOQUET thinks that the *rupture* may occur without the previous sphacelation, from the distension, the greater tenuity of the bladder, and the deficient support of its parietes at this situation. Admitting that ruptures of the bladder are generally in the fundus, yet they are less to be imputed to want of support in this situation and to greater tenacity, than to previous ulceration and deficiency of vital cohesion characterising the advanced stages of acute inflammation, although these circumstances may contribute to the event. But very few of the cases of rupture that occur depend upon previous sphacelation, which is an extremely rare occurrence in this disease.

65. *B. Chronic Cystitis.*—When the acute form of true cystitis has not terminated completely in resolution, it frequently passes into a chronic state of the disease. But this form may exist from the

commencement, and, appearing in a mild state, it is often neglected, and hence becomes an enduring disease. As in other inflammations, cystitis is observed of every intermediate grade of severity and of duration, from the most acute to the most chronic, according to the nature of the exciting and concurring causes and the peculiarities of the individual. The consequences resulting from the subacute or chronic forms of cystitis also vary with the severity of the attack. When the chronic is merely a continuation of the acute in a less severe degree, the nature of the disease is manifested by the persistance of the local symptoms especially, which are of a nature readily to be recognised and understood; and are chiefly those already adduced, but in a milder form.

66. When chronic cystitis occurs primarily its accession is sometimes slow, and scarcely so severe at first as to excite the anxiety of the patient. In other cases it is of a much more marked character, and more nearly approaches a subacute or an acute form. But in general it is characterised by permanent pain referred to some part of the viscus, by frequent calls to void the urine, attended by difficulty, as if occasioned by stricture of the urethra; by the presence of mucus or purulent matter in the urine; by tenesmus at stool and costiveness; by slight fever, especially in the evening, and sometimes by fever of a remittent or intermittent form; by a loaded tongue; by inability to retain much urine at a time; and by an exacerbation of some or of all the symptoms after fatigue, exposure to cold, or errors of regimen, especially after drinking spirituous, vinous, or malt liquors. These symptoms vary in degree, and one, more, or even all of them are more severe the more nearly the disease approaches a subacute or acute form.

67. The *duration* of this form of cystitis varies, according to the severity of the symptoms, from two or three months to as many years, or even longer. An acute or subacute state may supervene upon the chronic and shorten its duration; or the same result may follow the extension of disease to adjoining parts and the presence of serious complications. When it arises from calculi in the bladder, or from disease of the prostate or urethra, thickening of the walls of the viscus are common consequences. It may, when it approaches the acute or subacute forms, terminate in abscess, in ulcerations or perforation; or give rise to other lesions by extension of the inflammation to adjoining parts, as noticed in respect of the acute disease (§ 63.)

68. C. *Ulceration of the urinary bladder* may result from any one of the forms of inflammation of the mucous coat of the organ already noticed, but most frequently from the subacute, chronic, and most protracted states. It may, however, also follow the acute form and the more chronic states of true cystitis. It is often difficult to decide as to the existence of ulceration; but, when disease of the bladder has been of long duration, the pain severe and continued, with a frequently recurring desire to micturate, and an increasing difficulty and pain in passing the urine, then the existence of this lesion should be suspected, and, if the urine presents the appearances stated above (§ 48.), especially if it contains pus streaked with blood, it need not be doubted. *Ulceration* of the bladder may take place differently: it may commence in the mucous follicles, especially in the more chronic cases; or it may follow the acute form, lymph being first exuded from the inflamed surface and subsequently detached, leaving this surface tender and susceptible of irritation from the urine, and liable to experience ulceration from the continuance of the irritating cause. In acute cases, the mucous surface may thus be nearly all destroyed by the softening and ulcerating processes produced and perpetuated by the urine on the inflamed surface, the walls of the viscus becoming thickened, even although the muscular coat may be laid bare in parts.

69. When the ulceration is seated or commences in the follicles, *perforation* of the bladder may result, the disease having assumed most frequently a chronic form. When ulceration or destruction of the mucous coat follows acute cystitis, all the coats forming the parietes of the organ rapidly become implicated, and the disease soon terminates fatally. The more limited states of ulceration, especially when commencing in the follicles, may perforate the coats of the viscus, and, having reached the peritoneal surface, occasion the exudation of lymph, by which the bladder becomes united to adjoining parts; thereby preventing the escape of urine or forming a fistulous opening into some other viscus. In this manner a fistulous communication may be formed between the fundus of the bladder, the sigmoid flexure of the colon, or the cæcum, or the ileum, &c. When a fistulous opening is thus formed between the bladder and any portion of the bowels, fæces may pass into the bladder, unless the opening be formed between the under surface of the bladder and the rectum, and then the urine is usually voided with the fæces. Fistulous communications between the bladder and the rectum are more frequent, especially in females, than between the former and other portions of the intestinal canal. When communications are formed in this situation, either by ulceration commencing in the bladder or in the rectum, an abscess below the reflected portion of the peritoneum often forms, owing to the inflammation of the connecting cellular tissue caused by the urine or by the fæces. Mr. Coulson (*op. cit.*, p. 140.) has recorded some interesting cases of fistulous openings between the bladder and intestines to which I may refer the reader. Ulceration and perforation are always attended by hypertrophy or thickening of the coats of the bladder, whether they be consequent upon muco-cystitis or the more chronic or subacute states of true cystitis. When the ulcer is seated in the posterior and inferior part of the bladder, it may penetrate the coats so that the urine will pass into the cellular tissue between the bladder and rectum, producing the most destructive effects.

70. iv. Complications of Cystitis.— One or other of the forms of cystitis may be associated with some other disease or structural lesion. These diseases may be the causes of the inflammation of the mucous coat of the bladder, as well as its complication. This is especially the case with gonorrhœa, gleet, stricture of the urethra, syphilis, calculus in the bladder, rheumatism, gout, &c. *Gonorrhœa* often induces a severe and obstinate form of muco-cystitis, the discharge from the urethra being diminished as that from the bladder becomes more copious and the other symptoms

more distressing. On the other hand, the chronic forms of muco-cystitis, especially when they go on to ulceration, perforation, &c., induce disease of the kidneys, most frequently of the left kidney (RAYER, RICHTER, P. FRANK, COULSON, &c.). In these latter cases a dull pain is felt in the loins, is increased by pressure, and is ushered in by chills, rigors, sickness at stomach, and an albuminous urine, which also contains large quantities of puriform matter, often tinged with blood.

71. With ulceration of the mucous coat, hypertrophy of the muscular coat, contraction and thickening of the parietes of the organ generally result. The bladder, owing to its irritability, is constantly contracting upon the urine poured into it; and spasm of the sphincter often causes a regurgitation into, or an obstruction of the ureters; which thus become distended and tortuous, and still further changes are thereby induced. "The mucous membrane, extending upwards along the ureters to the pelvis and the infundibula of the kidneys, becomes inflamed and rough, and pours out a quantity of pus. The glandular structure of the kidney undergoes from pressure slow absorption. The capsule adheres with preternatural firmness to the exterior of the gland. Upon making a section of a kidney so diseased, we find that, although apparently of large size, it consists in great part of dilated tubes, and that the true vascular or secreting part is in smaller proportion than usual." (*Op. cit.* p. 144.)

72. The complications either of muco-cystitis or true cystitis are chiefly with diseases of adjoining parts, and arise from the extension of inflammatory action, either to these parts from the bladder, or from the latter to the former. Inflammation of the urethra, prostate gland, strictures of the urethra, calculus vesicæ, hæmorrhoids, colonitis or inflammatory dysentery, inflammations of the rectum and of the uterine organs, and kidneys, &c., may severally extend to, or excite inflammation of the bladder. On the other hand, this latter may involve the adjoining parts: it may extend from the fundus to the omentum, or to some of the convolutions of the intestines, or it may occasion peritonitis. This is not a frequent occurrence; but firm adhesions of one or other of these parts to the fundus of the bladder have been found on rare occasions, where, from the history of the cases, the bladder was the original seat of disease.

73. Inflammation may extend from the mucous coat of the bladder to the ureters, and along their course even to the kidneys; but this very frequent and important complication of uro-cystitis is most probably not often produced in this manner, but much more frequently by the occlusion of the ureters where they pass through the coats of the bladder, owing to the tumefied state of the inflamed parts at this situation. In this case the urine is secreted for awhile, but cannot pass into the bladder, owing to this condition of parts. Inordinate distension of the ureters, pelvis, and tubular structures is the consequence, and serious disease and disorganisation, not only of these parts, but also of the constitution, result.

74. The extension of inflammation of the bladder to the uterine organs is not infrequent; occasioning not merely adhesions between the serous surfaces, but also, particularly when cystitis is consequent upon, or is attended by retention of urine, retroversion or obliquities of the uterus, leucorrhœa, &c. The most frequent complication of cystitis is stone in the bladder, the inflammation being consequent upon, and generally occasioned by the solid concretion The frequent connection also of the several forms of uro-cystitis with gout and rheumatism, either as consequences of the misplacement or metastasis of these, or as occurring from other causes, owing to the predisposition to urinary disease occasioned by them, should not be overlooked, when ascertaining the causes and the relations of cystitis, or when determining the indications and means of cure.

75. v. APPEARANCES AFTER DEATH.— These vary much in different cases, and are more generally the consequences than the states forming the early, or even the advanced, states of the disease.—*A. After acute Muco-cystitis*, the inner surface of the bladder is thick, rough, of a reddish-pink hue, from capillary distension, with small ecchymoses, owing to exudation from the congested capillaries. The inflammation in most fatal cases is found to extend over the whole inner surface, although greatest in some parts, especially near the neck of the organ. Coagulable lymph is sometimes found covering or attached to the mucous coat. This tunic, in the most acute cases, may be detached from the muscular in parts, or even throughout, forming a greyish layer resembling a false membrane. In many instances the mucous coat has been destroyed by ulceration; "sometimes, however, round ulcerated spots, the size of a sixpence, are found in different parts, with elevated edges and a red surface." Ulceration generally commences at or near to the neck of the bladder, and extends more or less to the fundus; but it sometimes begins in the latter, and advances to the former. In the most severe cases the muscular coat is involved in the inflammation, presenting gangrenous or disorganised spots. One or other of the kidneys is also generally diseased, the pelvis being dilated or ulcerated, containing pus, and the ureters also being dilated and ulcerated at their vesical extremities.

76. *B.* In the slighter or early states of *chronic muco cystitis* the mucous coat is found, in cases of death from other diseases consequent on the former, injected, discoloured, thickened and softened, and its follicles enlarged and inflamed. It separates readily from the adjacent coat, is abraded in parts, and is even detached in spots by extravasations underneath. The parietes of the viscus are thickened and contracted, the muscular coat is greatly hypertrophied, and ulceration of the mucous coat penetrates to the muscular, or even further (§§ 68. 69.). When the ulceration is extensive, the hypertrophied muscular fibres appear, and resemble the columnæ carneæ of the heart, presenting a purplish-red colour; the mucous coat between the columns thus formed being pale, soft, and swollen. Pouches, or sacs, generally coexist, with dilated ureters, between these muscular columns, and are formed by the contractions of the bladder and of the abdominal muscles, in expelling the urine, forcing the mucous coat in places between the muscular fibres. These pouches are lined with a diseased mucous coat, which secretes an alkaline mucus, and are "sometimes the receptacles of a mortar-like matter, and finally of calculi, consisting generally

of phosphate of lime." As the disease proceeds in the mucous coat it extends to the ureters, to the pelvis, and to the tubular structure of the kidneys; and pyelitis supervenes. Ultimately the ureter leading to the kidney affected becomes dilated, tortuous, its lining membrane inflamed, granulated, or ulcerated, or sometimes covered with lymph. The pelvis and infundibula are much dilated, whilst the secreting structure of the kidney is reduced to a thin layer.

77. *C.* In the *more chronic states* and other cases of *muco-cystitis*, patches of a red colour, more or less deep, or from a bright red to a violet shade, are found in the mucous coat; and small ulcerated specks or points, apparently affecting the mucous follicles, are seen in these patches. In the more chronic cases the ulcers are of considerable size. When numerous they are generally small. Sometimes an albumino-puriform matter, adhering at points of the mucous surface, gives it an ulcerated aspect on a superficial view; and occasionally this surface appears elevated at numerous points, owing to an albuminous exudation in the subjacent cellular tissue. The whole internal surface is but rarely affected, although the greater part generally is, in the form of large irregular patches. In protracted cases the mucous surface is thickened, and this change often extends to the connecting cellular tissue; whilst the blood-vessels are more numerous and more engorged than natural. With these appearances the bladder is generally contracted, and the mucous coat forms a number of large wrinkles or folds, is often softened, and is occasionally encrusted, or covered in parts with a calcareous deposit. The prostate gland is often enlarged in these cases, is somewhat diminished in consistence, and readily admits of being divided.

78. *D. In true cystitis*, especially when chronic, in addition to increased vascularity, more marked in some places than in others, the parietes of the bladder is much thickened, and more or less contracted; but the extent of these changes varies greatly, being generally greatest in cases of chronic cystitis arising from the presence of stone. In some cases the thickening is moderate, yet attended by a varicose state of some of the veins of the viscus. Adhesions to adjoining parts of the fundus of the bladder, ulcerations, &c., are also seen in the circumstances and complications of the disease described above (§§ 63—69.).

79. vi. Diagnosis. — *A. Muco-cystitis*, when *acute*, may be mistaken for inflammation of all the coats of the bladder: but in the latter the desire to void the urine is much less frequent than in the former, and sometimes is not experienced until a large accumulation has taken place, and then it occurs in most severe paroxysms. The sense of scalding along the urethra felt in muco-cystitis is either slight, or absent when all the coats are inflamed. Occasionally the power to pass the urine is lost in this latter form of the disease, even when the desire is most urgent, and the act can be accomplished only after repeated efforts, or by surgical aid.

80. Many of the symptoms of acute muco-cystitis are experienced when *stone* is present in the bladder. But in cases of stone the pain is chiefly felt after the bladder has been emptied; whereas in acute muco-cystitis the pain is most intense when the bladder contains urine, and it subsides when the viscus is empty: in cases of stone, also, larger quantities of blood are passed than in muco-cystitis, and the urethra is seldom so irritable. (Coulson.)

81. *B. Irritability* of the bladder is to be distinguished from muco-cystitis, and true cystitis by the symptoms noticed above (§ 11.), and by the severity of the local affection, and of the constitutional disturbance. When, however, the irritability depends upon organic disease of the kidney, the diagnosis is more difficult. Mr. Coulson remarks, that the intense pain which attends inflammation and ulceration of the mucous coat of the bladder soon exhausts the patient, whilst in irritable bladder from diseased kidney there is sometimes, but not always, pain in voiding the urine; that the frequency of micturition is the most distressing symptom; and that, even when pain exists, it is never so severe as to wear the patient out, but may be, and often is, endured for years.

82. *C. The chronic states* of muco-cystitis are readily recognised. When mucus is passed in the urine in small or moderate quantity it may be mistaken for the involuntary discharge of semen, or of the prostatic fluid, which accompanies the evacuation of the fæces or of the urine in some persons; but semen differs from mucus in its colour, in its property of liquefying on cooling, in its insolubility in water when recent and thick, and its solubility when liquid, and in the radiating crystals which it produces after evaporation. The prostatic fluid may be distinguished by its remarkable transparency, by its stringy and slimy properties, and by its retention of these conditions until it is dried. The prostatic secretion is often mistaken for the seminal in cases where it is discharged, both being passed immediately after the bowels and the bladder are evacuated; but the prostatic fluid is passed much more frequently than the seminal, which is thus voided much more rarely than is often believed to be the case. Chylous urine is different from the urine voided in muco-cystitis, in being of a uniformly whitish hue, and the sediment formed by standing readily mixes with the urine on shaking; whereas the urine in this form of cystitis is at first turbid, and on standing the sediment becomes viscid, ropy, flocculent, or muco-puriform, or even purulent, and it has the appearances already noticed. (§§ 47—49.)

83. vii. The Prognosis depends much upon the age, constitution, diathesis, and habits of the patient, and on the exact seat, severity, and duration of the disease. It may even still more depend upon the consecutive lesions already produced, and upon the presence or absence of complications. If the disease be primary and uncomplicated, and the patient young or middle-aged, and of a sound constitution, or has not previously been subject to disease of the urinary organs, the prognosis is *favourable*; but, on the contrary, if he be aged, cachectic, has been subject to previous disease of the urinary organs, to stricture, or to any of the complications mentioned above (§ 70, *et seq.*), especially to disease of the kidneys, and still more particularly to this latter, occurring consecutively upon chronic muco-cystitis, the prognosis is *unfavourable*. In the more acute cases, as well as in the subacute and chronic, if the pain continue, notwithstanding a judicious practice; if the micturition be still frequent; if the urine be

loaded with a muco-puriform matter, epithelium, and a little blood; if a dull, heavy, and continued pain be felt extending from above the pubes to the sacrum or sacro-iliac symphyses, and especially if it be experienced in the loins and extend to the thighs; if emaciation and hectic be marked; and if vital exhaustion be rapid or extreme,— ulceration of the bladder, and consequent disorganisation of the kidney may be inferred, and a fatal issue be expected. If the states of true cystitis be followed by retention of urine, or if either form be followed by suppression, renal symptoms supervening, and no urine being found in the bladder, the danger is generally extreme. Whenever any of the severe symptoms mentioned above (§ 56. *et seq*) occur, whatever may be the stage, form, or progress of the disease, a most cautious prognosis should be formed.

84. viii. Causes of Cystitis.—*A.* The several forms of cystitis are most frequently met with in persons advanced in age, and in adults—particularly in the former. MM. Lesaive and Boisseau have, however, seen them in children between two or three years of age, and I have met with them as early as four and five years; but instances at this age are very rare, unless when accompanied with calculus in the bladder, or after injuries and operations. Cystitis frequently occurs in cold and humid climates, especially that form of it which is limited to the mucous coat: and it is common in persons addicted to fermented or spirituous liquors. Sedentary habits and occupations also *predispose* to it, especially in aged persons who are either confined to a sitting posture or to bed. An habitual neglect of immediately attending to the first desire of voiding the urine is a usual predisposing as well as exciting cause; the retention of this excretion occasioning irritation of the mucous surface and over-distension and diminution of contractility of the muscular coat. Females are less subject than males to muco-cystitis; but they appear quite as liable to the acute form of true cystitis, while they are less frequently affected with its chronic state, and to the complication of the disease with calculus and with disease of the kidneys. This partial immunity is owing to calculous concretions being less frequent and more easily removed in females; whilst diseases of the prostate and of the urethra are very frequent causes of the forms of cystitis in the male sex.

85. There are, perhaps, few causes which more frequently predispose to inflammations of the bladder than long-neglected disorder of the digestive organs, and especially to those states of cystitis which are complicated with calculous formations. There also seems to be a predisposition constitutionally inherent in some persons to diseases of the urinary organs, and consequently of the bladder, and especially in those of a gouty diathesis. Indeed, both the gouty and calculous diatheses often originate in the same sources, namely, in deficient vital energy, and long-continued disorder of the digestive functions connected with an excessive use of animal food relatively to the amount of exercise in the open air. The connection of the former state of the system with disease of the bladder is very evident, and the intimate relation which both diatheses hold to each other in respect both of their common sources and of their exciting causes, are satisfactory proofs of predisposition independently of the evidence furnished by experience of the frequency of cystitis in gouty habits. Persons of a scrofulous diathesis, or who have been addicted to venereal excesses or to the habitual use of highly seasoned dishes, to much animal food, and to sedentary occupations, are generally disposed to cystitis.

86. *B.* The most frequent *exciting causes* are, too long retention of the urine, exposure to cold and moisture, sitting on damp couches, sofas, or seats, or on cold stones, or on the ground; damp clothes on the lower extremities; damp feet; cold drinks whilst the body is perspiring; the abuse of diuretic and lithotriptic medicines; the excessive use of common gin; the incautious exhibition of emmenagogues; the internal use of cantharides or turpentine in too large or too frequent doses; the abuse of aphrodisiacs; the introduction of a catheter or sound, especially by unskilled hands; irritating or improper injections thrown into the bladder; the irritation caused by calculi or by morbid states of the urine; external injuries, or blows on the hypogastrium, especially when the bladder is full; coitus when the viscus is distended with urine; horseback exercise, with inattention to the evacuation of the urine; the pressure of the fœtus upon the unemptied bladder during labours; protracted labours and the use of instruments to facilitate the process; operations performed on the bladder; the suppression of accustomed discharges, as of fluor albus, hæmorrhoids, catamenia, and the sudor pedum, to which some persons are subject; the incautious suppression, without suitable internal treatment, of cutaneous eruptions, or healing of external sores or ulcers; the retropulsion or misplacement of gout and rheumatism; inflammations of adjoining parts; obstructions to the discharge of urine from strictures of the urethra, or from enlargement or abscess of the prostate gland; repelled gonorrhœa, and the use of injections for its cure.

87. Ambrose Paré, Cabrol, and Chopart have recorded some cases in which large quantities of cantharides had been taken as a cure for agues, and had occasioned cystitis of uncommon severity and fatal issue. The same result has followed the use of this substance as an aphrodisiac. Cystitis may also be the extension of inflammation from the pelvis of the kidneys to the bladder, or it may arise from the irritation of a calculus in that part of the ureter which passes between the coats of the bladder. It may also supervene in the progress of fevers, particularly of those characterised by stupor, coma, or delirium, or by congestion of the spinal chord, owing to the accumulation of urine of a highly irritating property; the local affection failing to excite the sensibility of the patient in these states, or the attention of the physician. The frequency and importance of this complication in fevers and in diseases of the brain and spinal chord should attract attention to it on every occasion, and on every visit.

88. Injuries and diseases of the spinal chord, its membranes, &c.; compression of, or hæmorrhage on, the chord; concussions of the brain or spinal chord, &c., are frequent causes of retention of urine, and thereby of cystitis. Even sudden jerks, as missing steps on descending stairs, coming with a jerk upon the feet when the body is erect, falling from a height on the

feet, especially when much water is in the bladder and a predisposition to inflammation of it exists, are occasionally causes of the disease. It may be remarked, that a single cause will in some persons more certainly produce its effects than the concurrent operation of several causes where little or no predisposition to the disease exists.

89. ix. Treatment. — *A. Of Acute Muco-Cystitis.*— The antiphlogistic regimen and treatment are required in all their details in this form of the disease. General and local *bleeding* should be prescribed, and even repeated, according to the age, habit of body, and constitution of the patient. Cupping over the sacrum, or leeches applied above the pubes or on the perineum, and repeated when circumstances indicate the propriety of the measure, are requisite; and in the milder cases, and in the less robust subjects, the local may supersede general bleeding. In some cases, especially when the symptoms indicate congestion or torpor of the abdominal viscera, or accumulations of sordes in the *primæ viæ*, an *emetic* will be given with benefit. After its operation has been freely promoted the bowels should be sufficiently moved by means of *cooling aperients*, as the infusion of senna with magnesia, the neutral salts, or the carbonate of magnesia and sulphur, &c. Bleeding ought not to be carried too far, especially in the inhabitants of large towns, and in the aged, cachectic, or delicate. Nor should those purgatives which are liable to irritate the rectum or colon be employed; but the bowels ought to be kept regularly open. A warm general *bath*, or hip bath, is always of service, and should be resorted to as early in the disease as possible after the above means have been employed, and should be repeated as often as the state of the patient will indicate. When the bowels have been evacuated, *opiates*, and *demulcents* or *emollients* are required, both to support the patient, and to allay the local irritation. These may be variously combined and exhibited, and may be conjoined with the alkaline carbonates. Morphia, or the preparations of opium, may be used, according to the medicines intended to be given along with either of them or at the same time. I have generally preferred the soap and opium pill, conjoined with an equal quantity of Castile soap. If these fail or lose their effect, emollient enemata should be administered, with either the syrup of poppies or compound tincture of camphor added to them. When these also prove insufficient to allay the local irritation, opiate suppositories may be resorted to, and a belladonna plaster be applied above the pubes, or over the perinæum, or a suppository containing some extract of belladonna may be tried. The state of the urine must be daily tested, and, as long as it continues acid, the carbonates of the fixed alkalis may be given, in demulcent vehicles, with such other medicines as the peculiarities of the case may suggest. As the disease lapses into a subacute or chronic state, the warm, or hip-bath, opiates with soap or alkalis, the infusion of pareira or of diosma, the preparations of cubebs, small doses of copaiba or of the other balsams, and the infusion or tincture of hops, may be severally prescribed.

90. The acute form of muco-cystitis will be protracted or pass into the subacute, and ultimately into the chronic form, if the *regimen* and *diet* of the patent be not duly regulated. All spirituous, vinous, and malt liquors should be relinquished, as well as acidulated or sweetened drinks or fluids. The food ought to be farinaceous, demulcent, and vegetable, and prepared in as bland a form as possible. The drink should consist entirely of linseed-tea, barley-water, or toast-water, gum-water, or marsh-mallow tea, taken in moderate quantities.

91 In severe or obstinate cases some practitioners have recommended the injection of oil and opium into the bladder by means of a gum-elastic catheter. As to this treatment, Mr. Coulson has very justly remarked, that the pain and irritation caused by the introduction of any instrument along the urethra are so severe, as to deter him from resorting to this treatment; for, unless there be retention of urine, the use of the catheter, sounds, and bougies should be avoided.

92. *B. Treatment of Chronic Muco-Cystitis.*— This form of the disease is often complicated with stricture of the urethra, or with disease of the prostate or kidneys; and it often also is consequent upon the acute form of the disease, owing either to neglect or to the constitution of the patient. In all cases, the treatment of this form of muco-cystitis is difficult, and more especially when it is complicated, and in the aged and cachectic. When the disease is simple, or consists chiefly of an abundant secretion of mucus (cystorrhœa), the decoction of pareira, or the infusion of buchu, with opium or morphia, or with the dilute phosphoric, or nitric, or nitro-muriatic acids, and the decoction or extract of uva ursi, are generally of service; but, where there are also much irritability and pain of the bladder, opiates given by the mouth, or in enemata are most requisite, and should be conjoined with every other method of cure. Sir A. Cooper recommends the balsam of copaiba, in doses of eight or ten drops thrice daily, with mucilage, sweet spirits of nitre, and camphor mixture. Mr. Coulson advises small doses of copaiba, or of the essential oil of cubebs with hyoscyamus, either to be given alone, or with the infusion of buchu, or with the decoction of pareira. He adds, however, that both copaiba and cubebs should be given with care; for, after the prolonged use of these remedies, an aggravation of the disease may result. He frequently, therefore, gives the compound tincture of benzoin, in the dose of a tea-spoonful, three times daily; and, when the urine is alkaline, and contains much mucus with the phosphates, an infusion of the dried *Alchemilla arvensis* (one ounce to a pint of boiling water), the dose being two ounces of the infusion three times in the day. The muriated tincture of iron, the ammoniated tincture of iron, the balsams, Chio turpentine, and other kinds of turpentine, uva ursi, with camphor and nitre, the sulphates of iron and of zinc, have also been severally employed in this state of the disease, and are generally of service when aided by opiates, and when the digestive organs and the bowels are duly regulated. Dupuytren relied much upon turpentine when the mucous secretion was great; and I have had occasion to observe its good effects; but it should not be long continued, although it may be given at intervals, or alternately with other means.

93. Persons of a scrofulous diathesis, or those addicted to venereal excesses, or who have suffered from syphilitic affections, or who are subject

to hæmorrhoids or to gout, are liable, when they are attacked, to an obstinate form of this disease. For these the treatment should have more or less reference to the state of constitution, whilst the local affection also obtains sufficient attention. The aged and cachectic also require to have their constitutional powers supported whilst the urinary disease receives requisite care. But in these latter persons palliation alone can be hoped for; and the prolongation of life, by means of a restorative or tonic treatment, opiates, and a regulated diet, is often the whole amount of benefit that can be expected.

94. When chronic muco-cystitis is associated with stricture of the urethra, or is produced by it, the treatment is extremely difficult. Mr. Coulson remarks that "the pain and irritation along the urethra are often so great as to render the use of catheters and bougies impracticable; and, unless the state of the urethra improve, no material benefit can be expected from internal remedies." Under these circumstances, having calmed the pain and irritation by means of sedatives, he proceeds to dilate the urethra with bougies or the gum-elastic catheter; and, if the stricture be of long standing and very narrow, he commences with armed bougies, introducing them once in three or four days.

95. The frequency of this, as well as other forms of cystitis in the gouty, and even also in the rheumatic diathesis; and of the occurrence of the disease in connection with, or upon the disappearance of gout, suggests the propriety of modifying the treatment conformably with this connection. In these cases I have found the opium and soap pill, with the extract of colchicum, taken at bedtime, and a sufficient dose of magnesia and sulphur, or magnesia and rhubarb, early in the morning, to prove of great service. One or other of the other means already mentioned, avoiding the acids, may also be given in the course of the day, as circumstances may indicate.

96. Other means, which more especially belong to the province of the surgeon, have been advised in the more severe and protracted cases of muco-cystitis. Sir B. Brodie states that when "the symptoms are at their greatest height the mildest *injections* (into the bladder), even those of tepid water, will do harm rather than good. They are especially to be avoided when the mucus deposited by the urine is highly tinged with blood. When, however, the symptoms are abated, the injection of tepid water, or decoction of poppies is, in many instances, productive of excellent effects." The fluid should be allowed to remain in the bladder about thirty or forty seconds, and not more than two ounces should be injected each time. Distension of the bladder by the injection so as to cause pain is injurious, and should be avoided. The operation may be repeated once or twice in the twenty-four hours. When the symptoms have abated and assumed a still more chronic form, and the mucus is *free* from blood, then one minim of the strong, or ten minims of the diluted, nitric acid, to two ounces of distilled water, may be used as an injection; the proportion of the acid being afterwards increased. Mr. Coulson remarks, that the tenacious mucus produced in this state of the disease deposits phosphate of lime; and when phosphate of lime from this source co-exists, as it often does, with the triple phosphate in the urine, a compound salt is formed; and that in such cases a weak solution of nitric acid (beginning with one minim of strong acid, increasing the quantity to two, to two ounces of distilled water) injected into the bladder acts as a salutary stimulant. As to Lallemand's cauterisation of the mucous membrane of the bladder with solid nitrate of silver, in cases of chronic catarrh, and as to Devergie's injections with balsam of copaiba and narcotics, I must refer the reader to the work of the author just mentioned, and to other surgical works.

97. It should not be overlooked that excessive mucous secretion from the surface of the bladder, if neglected, or treated too long with some of the more heating substances, which have been advised, may be followed by a chronic inflammation of all the coats of the bladder, and ultimately by a subacute or an acute form of the disease, which may destroy the patient. This result is most likely to occur when the *diet* and *regimen* so requisite to the success of treatment have been neglected. In the milder form of the disease, animal food, in very moderate quantity, may be taken. The diet should be chiefly farinaceous, but the white kinds of fish, boiled, may be allowed. In the severer states animal food should be still more sparingly taken. If, in these, the vital powers be much depressed, sufficient light nourishment may be given, and tonics with the alkaline carbonates, opiates, &c., may be prescribed. Spirituous, vinous, and malt liquors should be strictly prohibited; and all irregularity of diet and regimen carefully avoided. When there is great debility dry sherry may be allowed, especially if acidity of the *primæ viæ* be not experienced. In all cases the functions of the skin as well as of the bowels should be duly promoted.

98. C. *Treatment of Acute Cystitis—of Acute inflammation of all the Coats of the Bladder* (§ 56.).—It has been above (§ 55.) stated that the inflammation may affect one of the tissues of the bladder more than the others, or may implicate them all, chiefly through the medium of the connecting cellular tissue, and that a portion of the bladder may be thus affected, or the whole of the organ; that when the inflammation is seated in the neck of the bladder, the urine is retained by the tumefaction occasioned by it; and that when the parts through which the ureters pass into the bladder are chiefly affected, the swelling which results more or less obstructs the passage of the urine, and occasions dilatation of the pelvis, ureters, &c., by its accumulation in these parts and suppression of this excretion. The consequences of the *retention* on the one hand, and of the *suppression* on the other, are always most serious and should be prevented by a most active treatment as soon as these important and always dangerous states are present. The former may be removed by surgical aid; the latter by prompt and judicious medical treatment. But in most cases the treatment should have reference to the cause of the disease and the diathesis of the patient. When the malady is produced by cold in any form, then the phlogistic form may be inferred, and suppuration may take place, especially in the phlogistic temperament and full habit

of body. When it is occasioned by spirituous liquors, aphrodisiacs, or the suppression of the gonorrhœal discharge, although all the coats may be implicated, the mucous will generally be chiefly affected, and retention or suppression of urine less frequently result. If the disease occur in the gouty or rheumatic diathesis, or follow upon suppression or metastasis of either gout or rheumatism, all the coats may be affected, and neither the fundus nor its peritoneal covering escape.

99. In all these circumstances the treatment should be prompt and decisive, and the quantity of urine retained in the bladder carefully watched, by examining the hypogastrium and the quantity excreted. If the patient be young, or robust, or plethoric, although advanced in life, venesection should be prescribed and even repeated; and be followed by the local depletions, which may be sufficient for the delicate or weak, by cupping on the perineum, or by leeches applied to the part or to the pubes. Hot baths; warm fomentations above the pubes or on the perineum; the removal of the urine by means of the catheter whenever it may be required; emollient, laxative, and anodyne injections; cooling saline aperients, preceded by calomel and opium when the febrile symptoms are severe and the biliary functions are impaired; and demulcents with diaphoretics—are the means of cure which may be safely resorted to in all the circumstances of the malady just noticed. If the disease be consequent upon gonorrhœa, oleaginous or mucilaginous demulcents, with small doses of camphor, nitrate of potash and henbane, in addition to appropriate depletions, diaphoretics, aperients, &c., will generally remove the more urgent symptoms. If it be connected with gout or rheumatism, magnesia and sulphur in equal parts, either alone, or with demulcents, and small doses of colchicum, will be found very beneficial, by moderately promoting the abdominal secretions and the functions of the skin; this latter being too generally overlooked, especially in gouty affections. Under the above treatment the symptoms generally subside gradually; but if retention of urine be long neglected; or if the urine be suppressed, owing either to delay in adopting the above means, or the constitution of the patient and violence of the attack, delirium, coma, and death will generally result. It may be asked, what should be done in cases where the urine has become suppressed? I would answer, after the above means have been judiciously employed, that warm flannels, or stupes, moistened with spirits of turpentine, should be applied over the hypogastric region and perineum, and that emollient enemata, containing equal parts of this substance and castor oil, and one or more ounces of olive oil, be administered and repeated as they may be required, whilst diaphoretics should be assiduously continued.

100. When the inflammation of the fundus of the bladder implicates the peritoneal coat, or is *associated* with inflammation of the uterine organs or peritoneum, the treatment is not then materially different from that recommended above. Cupping over the sacrum, leeches to the hypogastrium, &c., the warm terebinthinate embrocations, or stupes, in these situations, calomel and opium, followed by the enemata and diaphoretics already advised, are the means most generally appropriate. If cystitis be complicated with hæmorrhoids or inflammation of the rectum or colon, or with fistula, calomel should be withheld, as it generally increases these affections and thereby prevents the resolution of the uro-cystitis, but the other means ought to be employed.

101. *D. Treatment of Chronic Uro-Cystitis.* — Chronic uro-cystitis is often consequent upon the acute, but it is oftener a consequence of stricture of the urethra, of enlargement of the prostate, of stone in the bladder, of prostatic calculi, of the abuse of spirituous liquors, especially of common gin; of the use of cantharides, or of cubebs or copaiba; or protracted gout and rheumatism, especially the former; and of the retention of the urine in the bladder after the desire to pass it. The nature of the cause influences more or less the treatment to be adopted. In strong, young, or plethoric subjects and especially when considerable pain is experienced, local depletion, followed by warm baths, the semicupium, fomentations, &c., is always required. In many cases the removal of the primary disease should be the first indication, especially in the case of stricture of the urethra; and with this indication the employment of means which act more or less directly on the bladder should also be adopted. In most instances the selection of these means should be guided by the state of the urine. If this be acid or scanty, the bicarbonates of the fixed alkalis with nitrate of potash and sweet spirits of nitre, in demulcent or emollient vehicles, will be generally of great service; and anodynes, such as the syrup of poppies, tincture of henbane, compound tincture of camphor, tincture of hop, opiate suppositories, &c., will also be prescribed in many cases with advantage. The preparations of pareira brava, or of the diosma, or of uva ursi, may, in the more obstinate or chronic cases, be given with the above, or the decoctions or infusions of these latter may be the vehicles for the exhibition of the former. When the disease occurs in the gouty or rheumatic diathesis, or appears after the suppression of either of these diseases, then the extract, tincture, or wine of colchicum in small doses, may be prescribed with the alkalis, and a small dose of opium or of morphia; and when the pulse presents much strength or hardness, the tincture of aconite, in the dose of one, two, or three drops, may be resorted to, although this latter is more appropriate in the more acute cases, and when the peritoneal covering of the viscus is implicated in the disease. The infusion of parsley-root is sometimes of service in chronic uro-cystitis, especially when made the vehicle for some of the medicines mentioned above. Mr. COULSON states that he has tried the infusion of wild carrot-seeds in this form of the disease with advantage, but that it should not be given if there be any irritation of the mucous membrane; and he adds that, as in these cases the bladder is, by its own efforts, seldom completely emptied, a catheter should be introduced from time to time, and the patient be instructed to do this for himself. Unless this direction be strictly attended to, the patient will become worse, and serious consequences ensue.

102. *E. When inflammation is extended to the peritoneal coat of the bladder*, either from the internal coats, or from parts in the vicinity of, or in contact with the peritoneal, the symptoms may

then be very acute, and become chronic from neglect or injudicious treatment. This form of the disease is most frequent in females, especially after parturition or in some period of the puerperal state, and is generally contingent upon the occurrences which sometimes take place during this state. In some cases it is strictly a partial peritonitis, confined chiefly to the pelvic peritoneum; the symptoms, local and general, being distinctive of its nature and seat. (See *Art.* Peritoneum, *inflammation of*, § 76.) The seat of pain, tenderness, and tension, the rapidity of the pulse, the position of the patient, the expression of the countenance, &c., indicate the nature of the disease, which may be limited to the pelvic peritoneum, especially when coagulable lymph is thrown out, which forms adhesions between the opposite surfaces, and prevents the extension of the malady. In unhealthy constitutions, and in females in the puerperal states, the inflammation, instead of being thus limited, generally extends over the peritoneum; in place of coagulable lymph, a serous fluid, of varied appearances, is thrown out, and the morbid action, commencing in the hypogastric region, extends through the abdomen, which becomes tender and tympanitic. The pulse is so rapid as hardly to be counted; hiccup supervenes, and the disease presents the course and termination described in the article Peritoneum (§§ 19—36.) In these cases the treatment is the same as I have advised in that article (§§ 137 — 159. *et seq.*).

103. In rare instances an abscess forms below the peritoneum, between the bladder and the symphysis pubis, or some other adjoining part, as in a case related by Dr. Elliotson. Sometimes also a pseudo-abscess is seated within the pouch of the peritoneum, between the posterior wall of the bladder and the rectum. Lymph, in these cases, agglutinates some folds of the intestines, or the sigmoid flexure of the colon and the fundus of the bladder, and pus collects in the pouch formed by these parts. The contents of this pseudo-abscess may be absorbed, if in small quantity, old adhesions alone remaining; or they may find their way into the peritoneal cavity, and occasion general peritonitis and death. Cases of this nature are mentioned by Mr. Coulson, and they have been seen by myself, but only in females and as consequences of pelvic peritonitis after parturition (see *Art.* Peritoneum, § 76. *et seq.*) and Puerperal Diseases (§ 221. *et seq.*).

104. V. Malignant and other formations are sometimes found in or attached to the parietes of the urinary bladder. *A.—Tubercle* is occasionally deposited in the parietes of this viscus, generally either under the peritoneal coat, at the fundus, and in the mucous membrane, near the urethra. In this latter situation the small granular deposits pass rapidly to ulceration. Tubercle of the vesical mucous membrane is, according to Rokitansky, rare, and is not always formed in connection with tubercular affections of the urinary and sexual organs. Tubercle on the exterior of the bladder is generally seen associated with the same formations in the vicinity, especially in the female sexual organs. Mr. Coulson remarks, that the morbid deposit may be so great as to glue together the different organs, and thus interfere with the free action of the detrusor urinæ; but this can only occur when the tubercular cachexia is inordinately developed. The most frequent appearance of tubercle in connection with the bladder is, in cases of tubercular peritoneum, that part of the membrane covering the bladder partaking in the general alteration, the deposit being commonly in small distinct masses, the membrane being spotted, dark-coloured, or rugous, or otherwise altered. (See Peritoneum, § 111 *et seq.*)

105. *B.* *A polypous excrescence* from the internal surface of the bladder is very rarely observed. Dr. Baillie saw only one example of it, and that filled up the greater part of the cavity of the viscus. An instance of it occurred to Mr. Crosse, of Norwich, in a child. Other cases of polypus vesicæ have been recorded by Mr. Warner and others, but they require no particular notice. The very interesting and instructive case published by the late Mr. Crosse will be found in Mr. Coulson's work.

106. *C.* *Malignant formations* in the bladder are not very rare. The worst form is that described by Mr. Travers and others as the malignant medullary fungus, which arises from the sub-mucous tissue, and projects into the cavity of the viscus as a soft, vascular, and cauliflower-like mass, which bleeds upon the slightest touch. Mr. Travers states that it springs from "the mucous coat of the bladder, and resembles that of the nares and uterus, breaking, bleeding, and reproduced as quickly as it is displaced. It is of very extensive attachment, and gradually reduces the cavity to very small dimensions. Portions of fungus and coagula of blood become plugged in the urethra, and form firm pellets, so as to produce retention of urine. It is a very painful disease. It keeps the patient in constant anxiety to void urine, which is more or less tinged with blood, and frequently he passes blood alone. He dies hectic and wasted." Mr. Coulson states that this malignant fungus is generally first developed near the neck of the bladder, the trigon, or the posterior surface; and that cases occur in which the vegetations fill a diverticulum or sacculus, where they form a tumour which may cause retention of urine by its pressure. These tumours vary in size, some being, when solitary, as large as a goose's egg; others are small, especially when they are numerous. Another form of medullary cancer has been described by Rokitansky as occurring in small masses between the muscular and mucous coats of the bladder. It may make its way through the mucous coat and form a deep carcinomatous ulcer, or may protrude externally through the muscular and peritoneal coats. Fibrous or scirrhous cancer, although sometimes affecting the uterus and ovaries, very rarely attacks the urinary bladder. These malignant formations cannot be assigned to any local cause of irritation, or to any other cause beyond the cancerous diathesis, hereditary or acquired. (See *Art.* Cancer, § 23. *et seq.*)

107. *a.* *The symptoms* of malignant tumours of the bladder frequently resemble those of stone. Warren states that the first sign of this disease is a discharge of blood with the urine. The quantity is at first so small as scarcely to tinge the urine; but it gradually increases until it becomes an exhausting symptom. The amount of pain attending it varies in different cases, being slight or moderate in some, and severe in others. Constant desire

to pass urine is one of the most common symptoms, accompanied with sympathetic irritation of the rectum and inclination to stool. When blood passes from the bladder, after the introduction of a sound or catheter, or after the flow of urine has terminated or very nearly terminated, there is much reason to infer that it proceeds from the coats of the bladder; and when this occurs, in connection with the other signs, and especially with the sense of the existence of a body or substance in the bladder, felt either by the patient or the operator when a sound is introduced, the existence of a malignant tumour, fungus, or polypus may be inferred. Ultimately, in these cases, consecutive disease and disorganisation of the kidneys, with more or less marked disorder of the stomach and bowels, and exhaustion of the powers of life, is followed by a fatal issue. I may refer the reader to Mr. COULSON's work for some instructive cases and *post mortem* appearances of this disease.

108. Disease of a disorganising nature may extend to the bladder from malignant disease of the rectum in men, or of the womb in females; and by means of ulceration a communication may be established between the rectum and the bladder, or between the bladder and vagina. Mr. TRAVERS, however, doubts whether the ulceration of the bladder in these cases be truly cancerous. In this doubt Mr. COULSON appears to partake. I have seen a few cases of extension of malignant disease from the neck of the uterus to the bladder, but in most of them have had reason to infer that the disease in the latter partook of the same character as that of the former.

109. *b. The treatment* of malignant disease of the urinary bladder is chiefly palliative, by means of narcotics, sedatives, &c., administered by the mouth or in enemata or in suppositories, as advised when treating of CANCER, and of diseases of the UTERUS, &c. In many of these cases the hæmorrhage from the bladder is so excessive that means are required to arrest the discharge and to sustain the powers of life. For these the tincture of the sesquichloride of iron, the decoction of pareira brava, with nitric, or hydrochloric, or sulphuric acid, if the urine be alkaline; the uva ursi, with the alkalis, if the urine be acid; the secale cornutum, spirits of turpentine, and other anti-hæmorrhagics and astringents, the recumbent posture, &c., are the means chiefly to be confided in, conjoined with opiates, &c.

110. VI. ABNORMITIES OF THE BLADDER are sometimes observed, either alone or in connection with malformation of other parts of the urinary or sexual organs. They are generally congenital, and proceed from irregularities of fœtal development. Numerous cases and various forms of irregularity of formation are on record, but as respects any treatment which may be adopted for them they concern the surgeon more than the physician, and sufficient reference may be made to them in the subjoined *Bibliography*.

111. *Foreign bodies* are often found in the bladder, having been introduced at some previous period, or having passed into it from the rectum or some part of the intestinal canal, through a perforating ulcer or sinus formed between the bowel and bladder. In many instances, when a foreign body has been found in this viscus, it had become incrusted by the urinary deposits to a greater or less extent. This subject will be found more appropriately discussed in surgical works, where also *rupture of the bladder*, *hernia of the bladder*, and *wounds and injuries of the bladder* are most ably treated of by their respective authors.

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URINE AND ITS DEPOSITS.—Classif. :— General and Special Pathology, and Therapeutics.

1. The urine is one of the chief depurating secretions in the animal œconomy, and one which when interrupted or arrested rapidly terminates existence. This secretion in some form or other occurs in all animals, either by a distinct apparatus, or by a vicarious or associated function, in which latter form it also takes place even in the vegetable creation; and in all it is characterised as the excretory function of nitrogenous elements and compounds, variously associated with other substances. In the human subject and in the more perfect animals the conditions of the urine depend upon the states of the frame generally, upon the states of the urinary organs, and upon the food and drink of the individual. Hence these conditions are of the greatest importance to the pathologist, by enabling him to recognise, 1st, those states of the system with which they are severally connected; 2nd, those lesions, functional and structural, of the kidneys, of which they are often the symptoms and effects; and 3rd, the influences produced by the food and drinks of the individual upon his system and urinary organs.

2. *The urine is derived from the blood* — is a depurating secretion performed by the kidneys from the blood as long as these organs are actuated by the organic nervous influence distributed to them, aided by whatever share of influence may be transmitted to them or their ganglia by the spinal nerves. The urine being derived from the blood, and being one of the chief depurating secretions by which the blood is preserved in due or healthy quantity and quality, it must be manifest that the phenomena connected with the urine and its secretion become important indications, not merely of the states of the blood itself, but also of the several sources by which the blood is altered or contaminated.

3. It was stated in the first part of this work, and then explained (in 1832), that the kidneys conveyed from the blood the fluids carried into the blood, and with these fluids the effœte materials, the ultimate results of animalization, and various other elements and substances resulting from indigestion and mal-assimilation, or otherwise absorbed into the circulating mass. As long as the kidneys discharge their functions, an excess of the fluid elements of the blood, and of various saline and nitrogenous materials, are prevented from accumulating in the blood; these functions being strictly depurating, as respects the purity or quality of the blood, and eliminating, or excretory, or excrementitious, as respects not only the quality but also the quantity of the circulating mass.

4. It is thus obvious that the urine consists chiefly of the fluids and of the fluid parts of the aliments taken into the stomach, and carried into the blood; and that it contains not only saline and other ingredients derived from the ingesta, and from the changes which the ingesta undergo, in the digestive canal, and in their passage into the blood, but also the effœte nitrogenous materials resulting from the waste and absorption of the tissues, which are first conveyed into the blood by the absorbents and veins, and afterwards eliminated from the blood, with the fluids in excess, by the action of the kidneys.

5. *Such being the source of the urine*, it may be inferred that the quantity and condition of this excretion will depend upon a variety of circumstances which require the recognition of the pathologist in his investigations of disease,— upon the states of the digestive and assimilating functions; upon the states of the circulating organs and of the blood; upon the states of the urinary apparatus; and upon the states of the other depurating and eliminating functions — upon those of the skin, lungs, liver, and intestines. In recent times, and in recent writings, the conditions of the urine have received a due, if not an excessive, share attention, especially from the chemical pathologists; yet these conditions have been insufficiently investigated in their relations to the other depurating functions, and especially to that of the skin, this particular function being either altogether overlooked, or very imperfectly inquired into. When treating of the Blood (see §§ 115—160) and when giving a succinct view of pathology under the head Disease (see §§ 94—104. and 163. *et seq.*), I there stated the same doctrines as those now enunciated, but more explicitly and fully than I have now done; and since then (published in 1832) the same views have received the approval of, because they have been altogether adopted by, more recent writers, although without acknowledgment of their long previous existence in the pages of this work. I may request those who may be curious in this matter to read what I have stated in the articles and in the sections just referred to, and to peruse the fundamental doctrines in Dr. Golding Bird's work on "*Urinary Deposits*," where the subject of urinary pathology has been very ably discussed, and where not only the views, but even the terms, first adopted by me have been followed and employed. I should not have referred to these principles of urinary pathology if it had not been necessary, by asserting my own priority in respect of them, to defend myself from the contingent imputation of adopting the ideas of others.

6. *b*. The doctrines insisted upon in the early parts of this work respecting the depurating functions of the kidneys and of other organs, have been much more recently carried out by Dr. G.

BIRD, as regards those of the kidneys, and in many places so conformably with these doctrines—although with too manifest a leaning to chemical pathology and neglect of a controlling vital influence—as to induce me to refer to his evidence on several topics, where I believe it to be accurate, or to support my own views. The fundamental principle he has laid down, is correct as far as it extends; but it is too limited, inasmuch as it is confined to the functions of the kidneys. He states that "it is, indeed, a general law, that any substance which has entered the circulating mass, and not been required for the nutrition of the body, nor forming a normal element of healthy blood, always escapes from the system by the kidneys, providing it exists in a state of complete solution. Hence these most important emunctories have the duty of removing any imperfectly assimilated elements of the food which had been absorbed while traversing the small intestines, and entered the circulating mass; as well as excreting the often noxious results of unhealthy digestion. To affect these most important conditions, it is essential that the substance to be removed should be soluble, or at least capable of being readily metamorphosed into a body soluble in the water of the urine, as nothing can be excreted from the kidneys, without breach of surface, unless in a state of solution. The third function performed by the kidneys, is their serving as outlets to evolve from the animal organism those elements of the disorganisation of tissues which cannot perform any ulterior process, nor be got rid of by the lungs or skin. The disorganisation of tissues here alluded to is a necessary result of the conditions for the growth and reparation of the body."—"The old and effete atoms of the animal structure are not excreted in the form of dead tissue; but, becoming liquified, they re-enter the circulation, their elements being re-arranged. One series of combinations thus produced, rich in nitrogen, is excreted by the kidneys, whilst those products which contain a preponderance of the inflammable elements, carbon, hydrogen, and sulphur, are called upon to perform, chiefly through the medium of the liver, an important office previous to their final elimination from the system. Thus the blood is not only the source of the elements derived from the food which serve for the nutrition of the body; but it also serves, like a sewer, to receive the matter arising from the waste and liquefaction of the old and exhausted tissues." (p. 256.)

7. Now, all the ideas contained in this quotation will be found fully and explicitly stated, as referred to above (§§ 3—5.) and in other places, but more correctly and more conformably with pathological conditions, than in the above passage in the *first volume of this work*, published many years before the appearance of "*Urinary Deposits.*" Besides, Dr. G. BIRD has overlooked the functions of the skin in relation to those of the kidneys, and has not taken a correct view of those of the liver in connection with the functions of the lungs, whilst those of the follicular apparatus of the intestinal canal and of the skin, have been altogether neglected. Yet all these functions, as I have elsewhere shown (see *the Articles* BLOOD, CRISES, DISEASE, and EXCRETIONS and EXCRETING FUNCTIONS, &c.), are more or less intimately related to each other and to the depurating functions of the kidneys, and often evince, even in health, a vicarious increase when one or more of the others are impeded or diminished, and a marked diminution when they are augmented. It should also be recollected, when estimating the source and nature of the functions of the kidneys and of other eliminating organs, that it is not only the materials mentioned in the above quotation, which are eliminated from the circulation by the kidneys, but also a portion of those resulting from the waste of the red-globules and fibrin of the blood, and that the kidneys are not the only depurating organs, the functions of the skin, liver, bowels, &c. being generally more or less impaired or otherwise disordered in those diseases which evince the most remarkable alterations in the state of the urine, these functions, especially that of the skin, being too generally neglected by modern physicians, in favour of the popular attractions furnished by the functions of the kidneys.

8. It is obvious, from what I have stated now and in earlier parts of this work respecting the sources of the urine, that this depurating secretion will vary in quantity and sensible appearances and physical properties, and even be remarkably altered, by a variety of causes—1st, by the quantity and nature of the ingesta, alimentary and liquid; 2nd, by the imperfect and disordered products of indigestion and mal-assimilation resulting from impaired vital power or simple or complicated ailments; 3rd, by the metamorphosis and waste of the several tissues and of the blood — the removal of effœte materials into and from the blood — during the healthy processes going on throughout the frame; 4th, by the waste and metamorphosis of the structures and of the blood, when accelerated by local or constitutional diseases; 5th, by the absorption of morbid secretions, and deposits or formations carried into the blood and partially, chiefly, or altogether eliminated by the kidneys and other emunctories; 6th, by the varying states of the other depurating functions—by the increase and diminution of one or more of these, diminishing, increasing, or altering more or less the functions of the kidneys.

9. Dr. PROUT considered that the elements of the albuminous tissues of the frame are so arranged, during the processes of metamorphosis or waste, as to be converted into uric acid, or urate of ammonia, and that the atoms or elements not composing these bodies form certain ill-defined principles. The ulterior changes which the gelatinous tissues undergo during destructive assimilation this very celebrated physician supposed to be intimately connected with their conversion into urea, and some saccharine principle, or its close ally the lactic acid. BARON LIEBIG followed in the path pointed out and first trodden by Dr. PROUT, and has been in several matters supported by the researches of MULDER, TAYLOR, B. JONES, and others. According to LIEBIG's theory, the elements of muscular tissue are carried into the circulation, combined with water and oxygen; the latter, by its union with the carbon of the effete tissue, supports the temperature of the body. On reaching the structure of the liver, 50 atoms of carbon, 1 of nitrogen, 45 of hydrogen, and 10 of oxygen, with an unascertained but considerable proportion of sulphur, are filtered off from the portal blood in the form of bile. The more highly nitrogenised elements of the metamorphosed or wasted tissues are separated by the

kidneys from the blood, chiefly in the form of urea and uric acid, whilst the carbonic acid, formed by the slow combustion of the carbon of the original atoms of muscle in the capillaries, is exhaled from the surfaces of the skin, and bronchi, and air-cells.

10. It is manifest that the atoms or elements of tissues, which have become worn out, or which have given place to new deposits in the course of nutrition, are carried into the circulating mass, where they undergo progressive changes under the influence of vitality, and are ultimately eliminated from the blood by the depurating organs. It has been supposed that the states in which the several materials are found on their elimination are such as may be altogether imputed to the action of the excreting organs: but it is more probable that the atoms or elements composing the materials removed from the structures, as well as those composing the blood, more especially the albumen, fibrin, red globules, and even the saline ingredients, undergo a succession of changes or modifications during their circulation through the body, until the great or ultimate change is produced by the organs which discharge them from the economy. It is not, however, conformable to the laws of the human frame that each organ should perform so simple and definite a function as the chemical pathologists believe. The skin certainly exhales carbonic acid; but it also discharges other materials by means of its follicular apparatus; whilst the bowels, chiefly by the same or a similar apparatus, also excrete effete materials from the circulation; and, although the combinations which are found during their elimination may be viewed as chemical, they are the results of vital action in health, are more or less modified in disease, and are such as rapidly undergo further changes after their discharge, or after death, which changes are more decidedly chemical, and such as their individual elements chemically dispose them to assume.

11. I. IN HEALTH, the urine presents certain conditions, *a.*, especially as respects *specific gravity*, at different periods and in different circumstances. These have been distinguished into, *first*, the urine which is excreted shortly after drinking freely of fluids, the nature of the fluids modifying the appearances and odour of the secretion. This (the *urina potus*) is generally pale, and of a specific gravity varying from 1·003 to 1·010. *Second*, the urine secreted shortly after the digestion of a full meal (*urina chyli*), varying in physical characters with the nature of the food, and other circumstances, and presenting considerable density, its specific gravity varying from 1·020 to 1·030. *Third*, the urine passed after a night's rest (*urina sanguinis*): this is of intermediate density, and varies from 1·015 to 1·025. In order to ascertain the specific gravity of the urine, in health or in disease, the portions passed before retiring to rest, and on rising in the morning, should be separately tested by the urinometer, and the average density of the two will be a near approach to accuracy. Dr. PROUT assigned 1·020 as the average gravity of healthy urine. M. BECQUEREL stated that it is 1·0189 in men, and 1·0151 in women, the mean in both sexes being 1·017; and Dr. ROUTH that the average of 18 healthy cases gave a specific gravity of 1·021.

12. The specific gravity of the urine at different periods of the day varies in disease, as well as in health, although in a less marked degree, and in some diseases more than in others; but this part of the subject has not been sufficiently investigated, and it is moreover liable to many sources of fallacy, as emotions of the mind, articles of diet, the beverages or drinks employed, the medicines taken, &c., all combine to render the results of observation uncertain. The nature, the stages, states, and course of disease, as of hysteria and other nervous disorders, febrile diseases, &c., also remarkably increase the difficulty.

13. *b.* The *quantity* of urine passed in the 24 hours, as well as its density and ingredients, varies much in health, but still more remarkably in disease. The quantity and quality are modified by temperature, by exercise, by the functions of the skin, &c., by modes of living, clothing, &c. Dr. PROUT estimated the quantity at 30 to 40 ounces in the 24 hours. Dr. ROUTH found the average of 18 cases to be 35 ounces. M. BECQUEREL considered the quantity to be 43 ounces in men and 47 in women, the general use of soups and weak subacid wines in France being productive of the increased discharge; but among the beer-drinkers of this country, the amount given by Drs. PROUT and ROUTH would be found much below the average.

14. *c.* The quantity of the urine is, however, no measure of the depurating actions of the kidneys; for 20 ozs. of urine in the 24 hours may carry off as much *solid materials* as 40 ozs. at a different time or in a different person; for a density of the former amounting to 1·030 will furnish an equal quantity of those materials to those afforded by the latter at 1·015. Dr. DAY has shown that the formulæ for calculating the solids contained in the urine, given by Dr. CHRISTISON is the most correct; and the following table calculated from it by Dr. G. BIRD will show at a glance the quantity of fluid and of solids existing in 1000 grains of urine of different densities. The gravimeter having shown the specific gravity, the proportion of solid matter is at once indicated by this TABLE:—

TABLE I.

Specific Gravity.	Solids.	Water.	Specific Gravity.	Solids.	Water.
1001	2·33	997·67	1·021	48·93	95107
1002	4·66	995·34	1·022	51·26	94874
1003	6·99	993·01	1·023	53·59	94641
1004	9·32	990·68	1·024	55·92	94418
1005	11·65	988·35	1·025	58·25	94175
1006	13·98	986·02	1·026	60·58	93942
1007	16·31	983·69	1·027	62·91	93709
1008	18 64	981·36	1·028	65·24	93476
1009	20·97	979·03	1·029	67·57	93243
1010	23 30	976·70	1·030	69·90	93010
1011	25·63	974·37	1·031	72·23	92777
1012	27·96	972·04	1·032	74·56	92514
1013	30·29	969·71	1·033	76·89	92311
1014	32·62	967·38	1·034	79·22	92078
1015	34·95	965·05	1·035	81 55	91845
1016	37·23	962·72	1·036	83·88	91612
1017	39·61	960·39	1·037	86·21	91379
1018	41·94	958·06	1·038	88·54	91146
1019	44·27	955·73	1·039	91·87	90913
1020	46·60	953·40	1·040	93·20	90680

15. By measuring the quantity of urine passed in a given time, the weight of solids excreted by the kidneys may readily be calculated by means of the foregoing and the following tables, a pint of distilled water weighing 8750 grains. The following table is given by Dr. G. BIRD:—

TABLE II.

Specific Gravity.	Weight of one Pint.	Specific Gravity.	Weight of one Pint.
	grains.		*grains.*
1010	8,837	1023	8,951
1011	8,816	1024	8,960
1012	8,855	1025	8,968
1013	8,863	1026	8,977
1014	8,872	1027	8,986
1015	8,881	1028	8,995
1016	8,890	1029	9,003
1017	8,898	1030	9,012
1018	8,907	1031	9,021
1019	8,916	1032	9,030
1020	8,925	1033	9,038
1021	8,933	1034	9,017
1022	8,942	1035	9,056

16. It may readily be calculated from these *tables*, that if 1000 grains of urine, of the specific gravity cf 1·020, hold 46·6 grains of solid matter in solution (*Table* I.), a pint of the same specific gravity, weighing 89·25 grains (*Table* II.) will hold 415·9 grains solid matter; and that, if two pints and a half of urine be passed, 1039·72 grains will be discharged in the 24 hours. Dr. GOLDING BIRD has calculated from Dr. CHRISTISON's formula a very useful table for showing the number of grains of solids in, and the weight of, a fluid ounce of urine, of every density, from 1·010 to 1·040.

TABLE III.

Specific Gravity.	Weight of one fluid Ounce.	Solids in f. ℥j.	Specific Gravity.	Weight of one fluid Ounce.	Solids in f. ℥j.
		grains.			*grains.*
1010	441·8	10·283	1025	448·4	26·119
1011	442·3	11·336	1026	448·8	27·188
1012	442·7	12·377	1027	449·3	28·265
1013	443·1	13·421	1028	449·7	29·338
1014	443·6	14·470	1029	450·1	30·413
1015	444·0	15·517	1030	450·6	31·496
1016	444·5	16·570	1031	451·0	32·575
1017	444·9	17·622	1032	451·5	33·663
1018	445·3	18·671	1033	451·9	35·146
1019	445·8	19·735	1034	452·3	36·831
1020	446·2	20·792	1035	452·8	37·323
1021	446·6	21·852	1036	453·2	38·014
1022	447·1	22·918	1037	453·6	39·101
1023	447·5	23·981	1038	454·1	40·206
1024	448·0	24·951	1039	454·5	41·300

17. By multiplying the number of ounces of urine passed in the 24 hours by the two last figures of the specific gravity, the quantity of solids excreted will be obtained. Thus if three pints, or 60 ounces be discharged in the 24 hours, and the density of the several specimens give an average of 1020, the 60 ounces multiplied by 20·79 would give a product of 1247 grains, the quantity of solids excreted in the 24 hours. Dr. G. BIRD estimates the average amount of solids excreted by the kidneys of the healthy adult to be from 600 to 700 grains in the 24 hours; numerous circumstances connected with occupation, exercise, diet, regimen, &c., modifying the results.

18. *d.* The *tints* presented by the urine in different diseases are of great importance in respect both of diagnosis and of treatment. These tints vary with the degree of dilution and the nature of the ingredients from nearly colourless, to the usual pale amber colour, to deep brown. When very watery, urine presents a faint greenish tint, as in early infancy, and in hysteria and chlorosis. If bile or blood be present in the urine, a variety of colours, from red to brown, blackish-green, or apple-green are produced, the latter hue being sometimes indicative of *cystine*. A *reddish* tint may be caused by *purpurine* or by *blood*; if by the former, congestion of the portal circulation, or disease of the liver or spleen, may be inferred; if by the latter, hæmorrhage in some part of the urinary passages has occurred. In the former case the specific gravity is moderate, and heat produces no change; in the latter, heat and nitric acid occasion turbidity, and blood-discs are seen under the microscope. A *brownish* tint is caused by a concentrated or dense state of the urine, as in fevers, the specific gravity being high; or by obstruction to the discharge of bile in some part of the biliary apparatus, and the presence of some or all the elements of bile in the circulation; or by the existence of blood in a less degree or altered state, and shown by the tests just mentioned. Blood and bile may occasion a greenish-brown tint, the former when the urine is alkaline, the latter when the urine is very acid. A grass-green hue of the urine indicates excess of sulphur and the presence of cystine. It is unchanged by heat or nitric acid. It should not, however, be overlooked that numerous articles of diet and of medicine affect the appearance of the urine. Chimaphyla, hæmatoxylum, indigo, rhubarb, senna, &c., produce this change in a marked degree.

19. *e.* The *fluidity* of the urine sometimes varies. It is more or less viscid, owing to the presence of mucus or pus, or both, especially when alkaline, and in the layer formed at the bottom of the vessel; and in a slight degree in diabetes mellitus, when the frothiness caused by agitation continues for some time. Although fluid whilst warm, it becomes in rare cases jellatinous on cooling, owing to the presence of self-coagulating albumen or fibrin. This state indicates severe organic disease of the kidneys. I have, however, met with it at advanced stages of pregnancy.

20. II. The CHEMICAL COMPOSITION OF THE URINE has engaged the attention of chemists and physiologists for many years; and even now the elements contained in this fluid, although nearly, if not altogether, ascertained, are still topics of controversy, as respects either the origin of certain of them, or the successive changes of which they may be the ultimate products. As to the general principle, that the urine is an excretion by which the blood is depurated from the effete materials carried into the circulation from the metamorphosis and waste of the tissues, &c., as stated above (§§ 3—10) and in the commencement of this work (*see* BLOOD, §§ 115—160), no doubt can now exist; but the successive changes which these elements or materials undergo during their absorption and passage from their origins and sources, during their circulation, and during their ultimate discharge,— from their origins to their elimination from the body,— have been long topics of research and discussion, especially by the chemical physiologists and pathologists of recent times, who have been more disposed to view them as altogether chemical, than as vital and as modified, and even more or less altered, by the states of vital power and vascular action. To the specialist in medicine the chemical doctrine presents itself in its most favourable aspect, as placing urinary pathology in an isolated yet scientific position. To the general or legitimate physician, the conditions of the urine, in all their phases, and in the successive changes from their origins to their ultimate results, are viewed as ever varying effects of the influence of vitality throughout the frame, as manifested by the functions of digestion, assimilation, nutrition, metamorphosis, waste, and depuration;

all which are not only under the complete and constant dominion of life, but are also the necessary agencies of the continuance of life; this department of pathology being inseparable, in its philosophic as well as in its practical relations, from all others which comprise the whole range and circle of morbid actions.

21. The *urine in health* contains:—1st, certain *organic products*, namely, urea, uric acid, creatine, creatinine, colouring and odorous elements; these more especially result from the metamorphosis and waste of the tissues and of the blood, and are separated from the latter by the kidneys: also other ingredients, more particularly lactic and hippuric acid, developed during the process of assimilation, and accidental matters carried into the circulation;—2nd, *inorganic products*, being saline combinations, derived from the food, especially sulphates, phosphates, chloride of sodium, and soluble salts taken with the ingesta, and often decomposed in their transit into and from the blood; also saline substances generated chiefly from the processes of destructive metamorphosis and waste, and of depuration, as sulphates and phosphates;—3rd, *matters derived from the urinary passages*, being chiefly mucus, debris of epithelium, and a minute quantity of phosphate of lime present in mucus. M. Becquerel gives the following as the average composition of urine in males and females, and the quantity discharged in the 24 hours:—

	Urine in Men.		Urine of Women.		Mean of Both.	
	In 24 Hours	In 1000 Grs.	In 24 Hours.	In 1000 Grs.	In 24 Hours.	In 1000 Grs.
Weight of urine	19516.		21124		20320	
Specific gravity	1·0189		1·0151		1·0170	
Solids	610·	31·1	526·8	24·95	568·	28·
CONSTITUENTS OF SOLIDS.						
Urea	270·	12·8	210·	10·366	255·	12·
Uric acid	7·6	0·391	8·6	0·406	8·1	0·398
Fixed salts	150·	7·63	126·	6·14	138·	6·9
Organic matters and volatile saline combinations	176·	9·26	145·	8·	160·5	8·6

22. *a. Urea.*—This important excretion, composed of C 2, N 2, H 4, O 2, = 60, is the form in which a large quantity of nitrogen is eliminated from the body; 270 grains of urea being discharged by a healthy man in the 24 hours. This substance is the product of the destructive metamorphosis or waste of organised parts (§§ 9, 10); but it is so rapidly carried out of the blood by the kidneys as to admit of only minute quantities of it escaping by the skin, unless when the functions of the kidneys are interrupted, and then it is discharged both by the skin and by the intestines in greater quantities. The *food* has a remarkable influence upon the quantity of urea in the urine. Dr. Lehmann found the quantity of urea excreted by his kidneys whilst living on strictly animal food, and whilst restricted to vegetable diet, as follows:—

	Animal Food.	Vegetable Food.	Mixed Diet.	Non nitrogenised Diet.
Urea in the urine in 24 hours	819·2	346·5	500·3	237·1

23. According to Lecanu the quantity of *urea* and of *uric acid* excreted in the 24 hours is very much influenced by age. The following are the results of his experiments, as to the amounts of these substances excreted in the 24 hours:—

	Urea.	*Uric Acid.*
Adult men	431·9 grs.	13·09 grs.
Adult women	294·2 „	10·01 „
Very old men (84 to 86 years)	124·8 „	6·77 „
Children (under 8 years)	138·2 „	3·98 „

24. *b. Uric Acid.*—Uric or lithic acid, composed of C 10, N 4, H 4, O 6, = 168, is excreted by the kidneys to the amount of 8·1 grains in the 24 hours. Dr. Prout's opinion, confirmed by Dr. B. Jones and Dr. G. Bird, is that the greatest portion of the uric acid always exists in the blood in combination with ammonia; for this acid requires 10,000 parts of water at 60°, for solution, whilst there does not exist quite 2500 times its weight. Urate of ammonia is soluble in 480 times its weight of water; and as it occurs in urinary deposits, it requires for solution 2789 parts of urine according to the researches of Dr. B. Jones, who has shown that the presence of a moderate quantity of saline matter increases its solubility. Dr. G. Bird states the following as the mode in which uric acid exists in healthy urine. "Uric acid, at the moment of its separation from the blood, comes in contact with the double phosphate of soda and ammonia, derived from the food, forms urate of ammonia, evolving phosphoric acid, which thus produces the natural acid reaction of urine. If the whole bulk of the urine be to the urate of ammonia formed, not less than about 2701 to 1, the secretion will, at the temperature of the air, remain clear, but if the bulk of fluid be less, an amorphous deposit of the urate will occur. On the other hand, if an excess of uric acid be separated by the kidneys, it will act on the phosphate of soda of the double salt, and hence, on cooling, the urine will deposit a crystalline sediment of acid sand, very probably mixed with amorphous urate of ammonia, the latter usually forming a layer above the crystals, which always sink to the bottom of the vessel." (*Op. Cit.* 84.)

25. Without referring to Liebig's views as to the physiological origin of uric acid, which are contradicted by the experiments of Lehmann, and merely stating that these views are not corroborated by any subsequent researches, I may give the results of the researches of this latter physician:—

Diet.	Quantity excreted in 24 Hours of		Proportion of Uric Acid to Urea.
	Uric Acid.	Urea.	
Exclusively animal	22·64 grs.	819·2 grs.	1 : 36·1 grs.
Mixed animal and vegetable - -	18·17 „	505·0 „	1 : 27·5 „
Exclusively vegetable - - -	15·7 „	346·5 „	1 : 22· „
Food free from nitrogen - -	11·24 „	257·1 „	1 : 21· „

Dr. **Bence Jones**, who has investigated this and other subjects connected with the chemico-pathology of the urine, with great scientific acumen, has shown the *immediate* influence of food on the quantity of uric acid contained in the urine, to be as follows:—

	Specific Gravity.	*Grains. Uric Acid.*
In 1000 *Grains of Urine:—*		
After animal food - -	1027	1·022
Before „ - -	1024	0·049
After vegetable food -	1025	1·010
Before „ -	1024	0·049

From these and other researches and considerations, it may be inferred that uric acid is derived from the nitrogenised elements of the effete molecules of the tissues, and from the elements of food abounding in nitrogen, which are not assimilated into the healthy constituents of blood; and probably from the latter source, in larger proportion; and thus these nitrogenised elements are excreted from the blood in the states of uric acid, of uric acid combined with ammonia, and of urea; the causes of the preponderance of either of these being not satisfactorily explained.

26. *c. Lactic acid and lactate of ammonia* were said by **Berzelius** to exist in the urine, but were denied by **Liebig**. That lactic acid exists in the blood, and is excreted by the skin in health, and more largely in some diseases, is admitted. It is, however, found in the urine of herbivorous animals; and it probably undergoes some change before it is excreted by the kidneys in the human subject. Dr. G. **Bird** considers that what was mistaken for lactic acid in urine, is really a mixture of *creatine* and *creatinine*, these substances being forms in which the nitrogenised elements of worn out structures, especially muscular tissues, are removed from the system. Dr. **Prout** believed that several of the constituents of urine were derived from the destructive metamorphosis of distinct and separate tissues, and these substances appear to support his views.

27. *d. Hippuric, or urobenzoic acid,* exists chiefly in the urine of herbivorous animals, and occasionally in that of man. Its quantity in health is not constant, probably owing to the nature of the food. It is, next to *bile* and *purpurine*, the richest in carbon of any of the products of vital chemistry; and hence its abundance in urine may depend upon the states of biliary secretion and of the respiratory functions, impairment of these increasing its excretion by the kidneys.

28. *e. Butyric acid* is sometimes found in the urine, and may be either referred to the butter used in food, or to the imperfect assimilation of saccharine matter. It is seen also in the creamy deposit formed in diabetic urine. This acid may also be derived from protein compounds.

29. *f. The colouring matter of urine* has been differently accounted for by **Simon**, **Prout**, **Heller**, G. **Bird**, and **Scherer**. The last-named physician attributed it to the destructive metamorphosis or waste of red-blood corpuscles. Dr. G. **Bird** investigated its nature and composition, gave it the name of *purpurine*, and viewed it as a principle of urine chiefly in disease; and as a result of impaired excretion of carbon by the lungs and liver, this element being, when existing in excess in the blood, partly eliminated by the kidneys in this form (§§ 27, 28.).

30. *g. Sulphur extractive* exists in urine, and is derived from the metamorphic destruction of albuminous and fibrinous tissues, which contain sulphur and traces of phosphorus. "Whilst the greater quantities of their protein elements are converted into creatine and its allies and urea, a small proportion containing the sulphur and phosphorus is eliminated by the kidneys in the form of this peculiar extractive matter." The taurine, a constituent of bile, may also be one of the sources of the sulphur extractive of the urine. The nature of the food may also contribute materially to the quantity of this constituent.

31. *h. Ammonia* exists in urine "combined with uric acid, and probably with phosphoric acid and soda, forming the triple compound known as microcosmic salt."

32. *i. The fixed salts of urine* are those which are left after the other ingredients are destroyed by a red heat. They amount to nearly 140 grains in the 24 hours, and consist of combinations of chlorine, sulphuric and phosphoric acids, with soda, lime, magnesia, and potass. Of these the combinations of chlorine and phosphoric acid are probably derived from the food. Dr. G. **Bird** considers that the phosphoric acid and soda in the urine exist in the state of the common rhombic phosphate unless it be combined with the phosphate of ammonia. The soluble phosphates far exceed in quantity the insoluble salts, and are derived directly from the food as well as from the albumen and other elements of the blood. The insoluble phosphates, forming part of the structure of the body, and derived from the blood during the process of nutrition, are conveyed back to the blood during the metamorphosis and waste of the structures, and are eliminated by the kidneys. "Some portion of the phosphoric acid of the urine is in all probability generated from the action of oxygen on many of the structures of the body, into the composition of which phosphorus largely enters, as the brain and nervous system generally. But the greatest part of the phosphoric acid is derived ready formed from without; the phosphates of lime and magnesia abounding in milk and most varieties of vegetable food; whilst the basic alkaline phosphates exist in flesh, in wheaten flour, leguminous seeds, as beans, peas," &c. The interesting researches of Dr. B. **Jones** have shown that the quantity of phosphates, in a given quantity of urine, bears some relation to the periods of taking food, and to the nature and composition of the food. He found the quantity of phosphatic salts to be much greater after a diet restricted to vegetable, than to animal food. The quantity of phosphates of lime and magnesia in the urine are considerably increased after the ingestion of soluble salts of these two earths. The alkaline phosphates are most abundant shortly after a meal composed

chiefly of bread, and are not materially affected by the circumstances which influence the excretion of the earthy salts. "A part only of the earthy phosphates contained in the food is absorbed into the circulation, the greatest proportion escaping by the intestines." Berzelius found in three ounces of human fæces six grains of earthy phosphates. The insolubility of the salts in water accounts for their presence in the fæces. A small quantity of phosphorus also exists in the urine in a non-oxidised form. The excess of phosphoric acid often found arises from the oxidation of the phosphorus of the urine.

33. *k.* The quantity of *sulphuric acid* in the urine is too great to be accounted for by its presence in the food as saline combinations; and sulphuric acid has been found in the urine whilst food quite free from sulphates has alone been taken. According to G. Bird and Mulder the origin of this acid is to be referred to the oxidation of the sulphur which exists with phosphorus in those tissues which contain albumen and fibrine. During the metamorphosis or waste of tissues, oxidation of the sulphur occurs, and explains the presence of at least a portion of the sulphuric acid met with in the urine. The existence of more than twenty per cent. of sulphur in taurine — one of the products of the metamorphosis of bile — accounts for a portion of the sulphuric acid, by referring it to the oxidation of the biliary sulphur during the recrementitious offices of bile in the economy. As a portion of sulphur is excreted from the body in a non-oxidised form, a part only of the sulphur not required for the purposes of the animal economy undergoes oxidation. Professor Ronalds found, in five specimens of urine of healthy persons, the proportions of sulphuric acid, and of the non-oxidised sulphur, existing in 1000 grains, to be as follows: —1·06; 0·17.—1·46; 0·18.—1·42; 0·18.—2·44; 0·153.—1·32; 0·165.

34. Dr. Bence Jones has shown, by his interesting researches connected with the subject, that the salts of this acid are increased in the urine by any kind of vegetable or animal food; that exercise does not appear to increase them, nor the administration of sulphuric acid, unless in large quantities; and that the ingestion of sulphur, or of the sulphates of soda or magnesia, always greatly augments the quantity of the sulphuric salts in the urine.

35. *l.* The *chloride of sodium* of the urine is obviously derived from the common salt taken with the food. Some of the saline constituents of the urine may be readily recognised by the crystalline forms they present when the urine is evaporated on a glass plate. MM. Regnault, Reiset, and Burral have shown that the chloride of sodium increased the excretion of nitrogen, as evinced by the augmentation of urea and the nitrogenised compounds in the urine. It may be inferred that common salt produces salutary effects: — 1st, by furnishing hydrochloric acid to the stomach; 2nd, by furnishing soda to the bile; 3rd, by aiding the metamorphoses of the blood globules and of the tissues; and, 4th, by promoting the depuration of the blood. The absence or diminution of chloride of sodium in the urine of patients labouring under pneumonia noticed by Redtenbacher was attributed to the alteration of diet during this disease. But Dr. Lionel Beale has established the following propositions, which show the insufficiency of this explanation: — 1st. Chloride of sodium is totally absent from the urine of pneumonic patients at the period of complete hepatisation of the lung. 2nd. The chloride reappears after the resolution of the inflammation. 3rd. The chloride exists in the blood in the largest quantity when most abundant in the urine, and *vice versâ*. 4th. The chloride exists in very large quantity in the sputa of pneumonic patients. 5th. There is reason to believe that the chloride in pneumonia is determined towards the inflamed lung, and is reabsorbed and removed on the resolution of the inflammation. (*Transactions of Medical and Chirurgical Society*, vol. xxxv. p. 374. &c.) I may, however, remark that the quantity of chloride in the expectoration is increased beyond that existing in healthy pulmonary mucus, and is diminished in the urine, in acute bronchitis, in pleurisy, and in phthisis, although not so remarkably as in pneumonia.

36. III. THE FORMATION OF URINARY DEPOSITS.[*]

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[*] CLINICAL EXAMINATION OF THE URINE.—DR. GOLDING BIRD has given the following recommendations for ascertaining the state of the urine in disease, provided that it be an average specimen of that passed in the preceding twenty-four hours, or that resulting from the first micturition after a night's rest, unless the urine secreted at other times be required.

A. Urine without deposit, or poured from the sediment. — After ascertaining the acid, alkaline, or neutral states of the urine by means of test-papers; a little of the urine should be heated in a metallic spoon over a lighted candle, or in a test-tube over a spirit-lamp; and if a deposit occurs, albumen or an excess of the earthy phosphates is present; the former, if a drop of nitric acid does not re-dissolve the deposit, the latter if it does. "If the urine be very highly coloured, and be not rendered opaque by boiling, the colouring matters of bile, or purpurine, are present. To determine this, pour a thin layer of urine on the back of a white plate, and allow a few drops of nitric acid to fall in the centre, an immediate and rapid play of colours, from bluish green to red, will be observed, if bile; but no such change will be observed, if purpurine alone exists. Should the high-coloured urine alter in colour or transparency by heat, the presence of blood should be suspected. If the addition of nitric acid to deep-red urine, unaffected by heat, produces a brown deposit, an excess of uric acid exists. If a specimen of urine be pale, immerse the gravimeter, and if the specific gravity be below 1012, there is a considerable excess of water; but if above 1025, the presence of sugar, or a superabundance of urea, is indicated. To determine the existence of either of these conditions, place a few drops of the urine in a watch-glass, add an equal quantity of nitric acid, and allow the glass to float in some cold water; crystals of nitrate of urea will appear on two or three minutes, if the latter exists in excess. Should this change not occur, the urine must be examined specially for sugar, which, it must be remembered, may exist in small quantities, without raising the specific gravity of the fluid." For this purpose, boil a small portion with an equal bulk of liquor potassæ, in a test-tube, and the developement of a brown colour will show the almost certain existence of sugar. An excess of colouring matter, rich in carbon, should always be sought after on account of its pathological importance. "This is readily done, by boiling some urine in a tube, and, whilst hot, adding a few drops of hydrochloric acid. If an average proportion of the pigment exist, a faint red or lilac colour will be produced; but if an excess is present, it will be indicated by the dark-red or even purple tint assumed by the mixture. Should the urine be alkaline, add a drop of nitric acid; if a white deposit occurs, albumen is present; if brisk effervescence follows the addition of the acid, the urea has been converted into carbonate of ammonia." (pp. 16, 17.)

B. Examination of the sediment deposited. "If the deposit is flocculent, easily diffused on agitation, and scanty, not disappearing on the addition of nitric acid, it is chiefly made up of healthy mucus, epithelial debris, or occasionally, in women, of secretions from the vagina, leucorrhœal discharge, &c. If the deposit is ropy, and apparently viscid, add a drop of nitric acid; if it wholly or partly dissolves, it is composed of phosphates; if but slightly affected, of mucus. If the deposit falls

Et seq. — When the several constituents of the urine are in due relation to each other, the urine is clear, and of a pale amber colour. Its transparency is but slightly affected on cooling by the gradual subsidence of a slight mucous cloud sometimes entangling a few microscopic crystals of uric acid; but when one or more of these constituents "exist in real or comparative excess, or a new substance is superadded, the urine does not generally remain clear, but either immediately upon being voided, or at least on cooling, becomes more or less turbid." When the urine, on cooling, becomes covered with a thin membrane-like scum, a *pellicle* is said to exist. When the substance causing opacity floats between the surface and the lower portions of the fluid, it is said to form a *cloud*. And when this falls towards the bottom of the containing vessel, the appearance was termed *encorema*. When a positive deposit collects at the bottom of the vessel, the term *sediment*, the hypostasis of the ancients, is commonly applied. The terms pellicle, cloud, and deposit, or sediment, are those commonly used in describing the states of the urine. These appearances are generally not fully developed until the urine is cooled down to the temperature of the air. This is especially the case with those deposits which are soluble in warm water; as the urates, particularly the urate of ammonia, which constitutes the chief part of reddish and fawn-coloured amorphous sediments.

37. *Urinary deposits*, including all substances which disturb the transparency of urine by their presence, whether they subside to the bottom of the vessel or not, have been divided by Dr. G. Bird into:—1st. "Deposits composed essentially of ingredients derived, directly or indirectly, from the metamorphosis of tissues—(to which I would add, from the metamorphosis and waste also of the red globules, fibrine, and other constituents of the blood)—or from the organic elements of food; namely, uric acid and urates, uric oxide, oxalate of lime, oxalurate of lime, and cystine. 2nd. Deposits composed of ingredients for the most part of inorganic origin, including phosphate of lime, ammonio-phosphate of magnesia, carbonate of lime, silicic acid. 3rd. Highly-coloured deposits (black or blue) of doubtful origin; viz., cyanourine, melanourine, indigo, Prussian blue. 4th. Deposits consisting of non-crystalline organic products, including—*organised:* blood, pus, mucus, organic globules, epithelium, spermatozoa, confervoid bodies, vibriones; *non-organised*: milk, fatty matter, stearolith.

38. i. Deposits of Uric Acid and of its Combinations.—Uric acid, uncombined with a base, forming a deposit, is invariably in crystalline forms. But the crystals are seldom so large as to admit of their figures being recognised without the aid of the microscope. Uric acid presents a yellow or amber colour, unless when mixed with urate of ammonia, which is frequently the case, and then it is of a much paler hue. These deposits present every shade of colour, from the palest fawn to the deepest amber or orange-red. The deeper the colour of the urine the darker are the deposits.

39. *A. Diagnosis of uric acid deposits.*—When heated in the urine, the uric acid deposit is not dissolved; the crystals merely become opaque. When mixed with urate of ammonia, Dr. G. Bird recommends the urine to be warmed in a watch glass; the acid then becomes visible at the bottom of the glass as soon as the urate dissolves. Heated with liquor potassæ, the uric acid deposit dissolves, forming urate of potash of ready solubility in the alkaline fluid. "Hydrochloric and acetic acids are without any action; but nitric acid readily dissolves it, and by careful evaporation a residue of a beautiful pink colour, becoming of a rich purple on being held over the vapour of ammonia, is left. This coloured residue is the murexid of Liebig, the purpurate of ammonia of Prout. Exposed to heat in a platinum spoon, the uric acid deposits readily burn, evolving an odour of bitter almonds, and finally leave a small quantity of a white ash, which contains phosphate of soda, or lime, or both."

40. *When urine contains an excess of uric acid* it generally forms crystals on cooling, uric acid being seldom deposited before emission. Sometimes, especially in the urine of gouty persons, many hours elapse before any is deposited, although a large quantity is present. Occasionally the acid is not deposited, but remains on the surface as a crystalline pellicle, presenting an iridescent play of colours in a bright light. Urine of a deeper amber colour than natural, or of a reddish-brown colour, usually deposits the largest amount of this acid; but very high-coloured urine seldom deposits uric acid until after the addition of a stronger acid; and urine does not deposit all its uric acid until decomposition has commenced. Urine depositing this acid

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like a creamy layer to the bottom of the vessel, the supernatant urine being coagulable by heat, it consists of pus. Urine sometimes appears opaque from the presence of a light flocculent matter diffused through it, presenting neither the tenacity of mucus, nor the dense opacity of pus. Although scarcely sufficient in quantity to interfere with the perfect fluidity of the urine, if a little be placed in a test-tube, and agitated with an equal bulk of liquor potassæ, the mixture will often become a stiff, transparent jelly. This peculiar appearance is demonstrative of the presence of the exudation, or large organic globules formed under the influence of irritation, providing the urine does not coagulate by heat; for should it do so, the existence of minute quantities of pus may be suspected."

"If the deposit is *white*, it may consist of urate of ammonia, phosphates, or cystine: the first disappears on heating the urine; the second, on the addition of a drop of diluted nitric acid; whilst the third dissolves in ammonia, and the urine generally evolves an aromatic odour, like the sweet-briar — less frequently being fœtid. If the deposit be *coloured*, it may consist of red particles of blood, uric acid, or urate of ammonia stained with purpurine. If the first, the urine becomes opaque by heat; if the second, the deposit is in visible crystals; if the third, the deposit is amorphous, and dissolves on heating the fluid. Oxalate, and more rarely oxalurate (?) of lime are often present, diffused through the urine, without forming a visible deposit; if this be suspected, a drop of the urine, examined microscopically, will detect the character of the crystals. If the urine be opaque, like milk, allowing by repose a cream-like layer to form on the surface, an emulsion of fat with albumen is probably present. Agitate some of the urine, with half its bulk of ether, in a test-tube; and after resting a few minutes, a yellow etherial solution of fat will float on the surface of the urine, a tremulous coagulum of albumen generally forming beneath it."

Dr. G. Bird adds that much of the little time required for the investigation thus sketched may be saved, by remembering the following facts: "*If the deposit be white, and the urine acid, it in the great majority of cases consists of urate of ammonia; but, should it not disappear by heat, it is phosphatic. If a deposit be of any colour inclining to yellow, drab, pink, or red, it is almost sure to be urate of ammonia, unless visibly crystalline, in which case it consists of uric acid.*" (pp. 18—21.)

always reddens litmus paper, and often contains an excess of urea, so as to crystallise when mixed with nitric acid. Its specific gravity is generally above 1·020, excepting in infants, in whom deposits of uric acid are common, although the urine may be pale and of a much lower density. These deposits "appear as a yellow crystalline sand, whilst the supernatant urine is of low specific gravity, often 1006, as pale as water, and contains very little urea." This circumstance admits of explanation from the small proportion of alkaline phosphates, the presumed solvent for uric acid in the urine of infants. For the various microscopic characters of uric acid deposits which can only be satisfactorily shown by engravings, I must refer the reader to Dr. G. Bird's interesting work.

41. *B. Diagnosis of deposits of urate of ammonia.*—These vary in colour, from white, through every tint, to a pale fawn (the oftenest met with), brick-red, pink, or purple. All these deposits have certain characters in common. They never take place until the urine has cooled, and quickly disappear on the application of heat. The darker coloured deposits require a higher temperature for solution than the paler; and when the urine is scanty and concentrated, as in acute rheumatism, the addition of a little water may be required before they quite disappear. The addition of liquor ammoniæ, or liquor potassæ, quickly dissolves deposits of urate of ammonia, rendering the urine a little turbid from the precipitate of earthy phosphates. Deposits of urate of ammonia always contain small quantities of the urates of lime and soda, and often of magnesia and potass.

42. *Urine depositing urate of ammonia* presents several modifications: — 1st, a pale urine of low specific gravity (1012) with a nearly white deposit, which, instead of entirely falling, forms masses in the fluid, and appears as a mucous pus. The application of heat shows at once its real nature by causing its disappearance. 2nd. A pale amber-coloured urine, of a specific gravity about 1·018, which, on cooling, deposits a copious fawn-coloured substance resembling powdered bath-brick mixed in the water, but very readily disappearing on applying a gentle heat. This deposit occurs often, readily disappears, and frequently attends a cold, obstructed perspiration, or slight indigestion. 3rd. A deeper-coloured urine, of a higher specific gravity (from 1022 to 1026), and deposits, on cooling, a reddish-brown sediment —the well-known brick-dust or lateritious sediment. This variety generally is present during febrile excitement, and becomes turbid on the addition of a drop of nitric acid, "not from the coagulation of the albumen, but from the precipitation of uric acid in very minute microscopic rhomboidal crystals." 4th. Urine of a very deep colour, approaching to a copper, or purplish tint, or to purplish hue. This colour Dr. G. Bird attributes to the presence of *purpurine*. He adds that, whenever a deposit of urate of ammonia occurs in such urine, either spontaneously or by immersing it in a freezing mixture, it combines with the pink pigment, forming a kind of *lake*, and which is often so abundant as not to entirely disappear by heat, until the urine is diluted with water. This state of the urine is often observed in acute rheumatism, gout, in diseases of the liver and spleen, &c., and has been attributed to obstructed elimination of carbon.

43. ii. Pathological Relations of Uric Acid, and Urate of Ammonia.—Independently of changes in the quantities of these substances in the urine, caused by the quantity and nature of the food, very important alterations of the proportions of these substances accompany and characterise various pathological conditions of the frame. Uric acid and its combinations have been attributed to two sources, viz., the waste or disintegration of the tissues, and nitrogenised food. But it appears to me that too large a share of these sources has been imputed to the former (which is more correctly the nutritive metamorphosis, and waste of the tissues), whilst the metamorphosis and waste of the globules, fibrine, and albumen of the blood, as contributing to the formation of these substances in the urine, have been overlooked. In disease, especially in acute diseases, as long as the kidneys are enabled to discharge their functions, an increase of uric acid and its compounds appear in the urine; and this increase is to be imputed chiefly to the waste of the tissues, and of the hæmato-globuline, for little or no nitrogenised food is generally taken in these cases, but emaciation, and with this more or less of anæmia, supervene. The anæmia, which is often remarkable, especially in the advanced progress of these diseases, is often overlooked. In acute rheumatism, gout, fevers, diseases of the liver, spleen, &c., the elements and sources of uric acid and its compounds are abundantly supplied by the states of the blood to the kidneys; and uric acid, both pure and combined, is greatly in excess in the urine. MM. Becquerel and L'Heretier found, in eleven cases of inflammatory fever, and twelve of continued fever, the uric acid more than double that in health.

	Acute Inflammations.	*Fever.*	*Health.*
Specific Gravity of the Urine - - -	1·0216	1·0229	1·017
Uric Acid in the Urine	1·041	1·312	0·391

44. That uric acid and its combinations may be formed to some extent in the blood, at least in some diseases, especially gout, rheumatism, erysipelas, &c., and eliminated by the kidneys, is rendered probable by the circumstance of urate of soda having been detected in the blood by Dr. Garrod. But the presence of this combination in the blood does not preclude the elaboration of a portion of the uric acid and its compounds, or the modification and metamorphosis of one or more of them, or their elements, by the kidneys.

45. In diseases of debility, especially in those characterised by depressed or exhausted organic nervous power, and by a poor or anæmied state of the circulation in hysteria, chlorosis, disorders of irritation, &c., uric acid and its compounds are greatly reduced in the urine, unless the quantity of urine passed be remarkably diminished, and no deposits are formed.

46. The state of the perspiratory function is too often overlooked by those who attend especially to the urine. Whenever the functions of the skin are impeded or interrupted, those of the kidneys are augmented; and the results are reversed when the perspiratory actions are increased. But the increase or diminution of either does not

consist merely in the watery element, but also in the nitrogenised and other materials held in solution. This reciprocative or vicarious function, and more especially the frequent want or imperfection of compensation existing between these functions, are most intimately connected with the origin of many diseases, and are not the less productive of most dangerous results in the progress of others. I have always insisted, in my lectures (delivered from 1826 until 1842), upon the influence of an insufficiently depurated blood—of effete materials circulating in the blood—owing to impaired function of either the kidneys, the skin, or the intestinal mucous surface and follicles, or of two or all of these; or to an imperfect compensation of function of the others, when one is impaired or interrupted, in causing diseases not only of a serious and acute character, but also of a chronic and obstinate, although not dangerous kind. Most of the diseases of the skin, especially those which are most disposed to become chronic, are induced, or perpetuated, or both, not only by impaired depurating function of the skin and its follicles, but more especially and remarkably, also, by imperfect action of the kidneys, and of the intestinal mucous surface and follicles; the effete and nitrogenised elements and materials, and their combinations, retained and accumulating in the blood, irritating the cutaneous capillaries, and the capillaries of predisposed and sensitive surfaces and tissues. The crises of fevers and inflammatory diseases are merely the returning functions of depurating organs, and the free discharge by these emunctories of effete nitrogenous elements and materials and their compounds, chiefly by the kidneys, bowels, and skin. This doctrine has been fully elucidated in the Articles BLOOD, CRISES, and DISEASE (published in 1832 and 1833), and has been applied to the illustration of the causes and phenomena of CRISES (See §§ 15—20.). Long after the publication of my views, Professor LIEBIG referred the products of elimination from the blood by the emunctories, and especially those discharged by the kidneys to chemical changes; but his explanations are opposed to clinical observation; whilst the researches of M. BECQUEREL (*Séméiotique des Urines, &c.* 8vo., Paris, 1841.) tend to confirm the opinion contained in the articles now referred to.

47. (*a*). Excess of uric acid, or of its combinations with bases in the urine, the quantity of this fluid being natural, occurs in fevers, acute rheumatism, gout, erysipelas, inflammatory diseases, hepatic and cutaneous complaints, &c., chiefly from the waste and absorption of the tissues, and the metamorphosis of the elements and materials derived from these sources, and from the blood aided by oxygen conveyed into the circulation by the red globules. (*b*) A similar excess may also arise from an excessive indulgence in animal food, especially in highly nitrogenised flesh-meats, or from an indulgence in this kind of food beyond what is required for the nutrition of the several structures, or from a more moderate use of this food, due exercise, especially in the open air, being neglected. (*c*). Excess of these substances may occur in the urine, although the supply of nitrogenised food is very moderate, owing to impaired digestive, assimilative, and nutritive function. (*d*). Excess may also occur in consequence of impaired or arrested action of the skin and bowels; the kidneys discharging a more or less compensating function, and eliminating a portion or the whole of those elements and their combinations usually discharged by these other emunctories.

48. (*b.*) *Calculous Deposits of Uric Acid and Urates.*—An abundance of uric acid and of the urates in the urine may occur without producing much disturbance to the urinary or other functions. This is especially the case with urate of ammonia, which can hardly be ascribed to disorder, but rather to the healthy discharge of the depurating function of the kidneys. But, as Dr. G. BIRD has justly remarked, "Uric acid or urates may be deposited in an insoluble form in the kidneys or bladder, and aggregating form a mass on which, by a kind of imperfect crystallization, great quantities of the acid or its salts may be deposited, giving rise to the formation of a calculus. Uric acid is of more serious importance than most other elements of calculous formations, not only from its constituting a large proportion of all urinary calculi, but even when they are chiefly composed of other ingredients, the nuclei on which they are deposited are, in the great majority of cases, composed of uric acid. Of 374 calculi contained in the Museum of Guy's Hospital, at the time I examined them, the nuclei are in 269 composed of uric acid or urate of ammonia. On account of its solubility, urate of ammonia is not a frequent component of entire calculi, although it often enters with other ingredients into their composition. Indeed, calculi wholly composed of this compound are almost peculiar to childhood; in GUY'S Museum there are but eight concretions entirely consisting of this substance, although it constitutes the nucleus in eighteen. It is hence very probable that if ever by medical treatment we can succeed in overcoming a calculous diathesis, or dissolving a stone in the act of growth, it will be by means directed to the solution of the uric acid, or its combinations." (*Op. cit.* p. 154.)

49. iii. TREATMENT OF DEPOSITS OF URIC ACID AND URATES.—From the foregoing, it is apparent that excess of these materials in the urine, and the deposit of them, either in some part of the urinary apparatus, or after the urine is discharged, are contingent upon a variety of antecedent disorders or pathological conditions, which, in individual cases, require due recognition and appropriate means; and not upon those alone, but also, in different cases, or in different circumstances, upon an excessive or improper diet and regimen, or upon insufficient exercise. One of the most important and most generally prevalent of these conditions, more especially when these materials are deposited in large or unusual quantities, and still more particularly when they are deposited in any of the urinary organs, is depressed or exhausted organic nervous power, occasioning impaired digestion, assimilation, and nutrition. This condition suggests the employment of such means as experience has shown to be most efficacious in restoring the organic nervous power to its former energy, throughout the organs devoted to digestion, assimilation, and nutrition. This *indication* of cure should be fulfilled,—1st by medicinal treatment; 2nd, by suitable diet and regimen; and third, by exercise in the open air, and residence in a healthy locality.

50. *a. Medicinal treatment* comprises the several means of cure already recommended under the separate heads of Indigestion, Gout, Pyrosis, &c.; but there are substances to which special reference may be made for removing and dissolving the deposits above noticed, and for counteracting the disposition to their formation. The medicines which may be employed in these cases are either restoratives and tonics, or are solvents of uric acid; and others may be so combined as to operate in this double capacity. The first of these consist chiefly of the tonic vegetable infusions and decoctions; the second of alkalies and alkaline salts; the former being generally made the vehicles for the exhibition of the latter—more especially of the following, viz., the liquor potassæ, Brandish's alkaline solution, the carbonate of potass and soda; the citrates, acetates, and tartrates of potass and soda; magnesia, and the citrate and carbonate of magnesia; the biborates of potash and of soda; the phosphates of soda and of ammonia, and the benzoic and citric acids. Certain mineral substances are likewise of use, especially the alkaline preparations of iron, the nitrate and oxide of silver or bismuth, and the sulphate and oxide of zinc, which may be given in various states of combination, and in the form of pill. It may be remarked respecting certain of the foregoing, that the preparations, especially the carbonate of the fixed alkalies and the liquor potassæ are often most beneficially conjoined with the iodide of potassium, and prescribed in a tonic bitter mixture; that the phosphate of soda may be taken freely in gruel, so as to act gently on the bowels; that magnesia will be most beneficial when given with sulphur, and so as to act upon the bowels, kidneys, and skin, which it will generally do when taken at night; and that the biborates may be prescribed in stomachic infusions with salts of the vegetable acids. Benzoic acid was recommended by Mr. A. Ure, to prevent the formation of uric acid. It may be given in doses of five to ten grains, thrice a day, with carbonate or phosphate of soda, or with the carbonate of ammonia, dissolved in boiling water. Citric acid was strongly recommended by Dr. Owen Rees for diseases, especially gout and rheumatism, in which uric acid and urates are abundantly formed; and whether it be given as an addition to the patient's drink, or in combination with the alkalies, it is often of great service. With magnesia, either in the form of citrate, or as recent lemon-juice or lemonade taken immediately after the magnesia, it is equally beneficial.

51. Most of the diseases, or slight states of disorder in which uric acid and the urates are deposited, are characterised by deficiency of the cutaneous excretion, and insufficient attention is directed to this function in many cases. The restoration of this excretion by means of the warm bath, or the vapour bath, followed by frictions of the surface, by walking, or other active exercises in the open air, is a most important indication of cure where these deposits appear in the urine, both in preventing and in permanently removing the complaints in which they are the general concomitants.

52. *b.* The *mineral waters* which contain the alkalies, or sulphur, as those of Vichy, of Ems, or of Harrowgate, will also be resorted to with benefit. But whatever be the treatment, the quantity of flesh-meats used as food should be abridged, and farinaceous and vegetable substances, or the white kinds of fish, boiled, be partly substituted, more especially when active exercise in the open air is not enjoyed, and when the functions of the skin are imperfectly performed.

53. *c. Uric Oxide—Xanthic Oxide—Xanthine, Pathological Relations of.*—This substance is a very rare ingredient of calculous deposits or concretions; and it has been observed only in single instances by Marcet, Langier, Langenbeck, Dulk, Berzelius, and Morin. The chemical constitution and the diagnosis of uric oxide are given by Dr. G. Bird, to whose work I may refer the reader. The *character* of urine depositing this substance is not known. The microscopic examination of a fragment of calculus consisting of uric oxide did not furnish any information, as respects a crystalline arrangement. The only recorded cases of the formation of this deposit occurred in children, and the calculi formed by it did not exceed a few grains in weight.

54. iv. Purpurine, its Pathological Relations.—Deposits of urate of ammonia coloured by this substance (§§ 39—42.) present tints varying from pale flesh-colour to the deepest carmine. "The presence of purpurine interferes with the ready solubility of the deposit with which it is combined on the application of heat, and free dilution with water is often required to aid its solution." Dr. G. Bird states that he has never seen purpurine colouring any other deposits except those of urate of ammonia, and hippuric acid when precipitated from concentrated urine by hydrochloric acid. Uric acid scarcely appears to have any affinity for it. It cannot be mistaken for blood, on microscopic examination, owing to the absence of blood-discs. The chemical composition of purpurine occurring in disease is not exactly known. Scherer states that that generated by the action of hydrochloric acid on urine consists of 62·51 of carbon, 5·79 of hydrogen, and 31·70 of nitrogen and oxygen. Urinary calculi sometimes present layers of urate of ammonia stained with purpurine. Dr. G. Bird remarks that all the deposits with which it is combined were, as far as he had observed, amorphous.

55. *A. The Characters of the Urine containing Purpurine.*—When an excess of urate of ammonia is present, it falls to the bottom of the vessel as the urine cools, carrying with it a great part of the purpurine. "If this excess be not present, the urine simply presents a pink or purple colour, and on dissolving white and pure urate of ammonia in it by heat, it is precipitated on cooling, deeply coloured by the purpurine. The presence of the yellow extractive which yields purpurine can be readily discovered by the action of hydrochloric acid. On evaporating urine containing purpurine to the consistence of an extract, and digesting it in alcohol, a fine purple tincture is obtained—the intensity of the tint being rather heightened by acids and diminished by alkalies." The specific gravity of this high-coloured urine, when the colour is as deep as that of brandy, varies from 1·022 to 1·030.

56. *B. The pathological Indications of an Excess of Purpurine* are important. Dr. G. Bird remarks that the existence of purpurine in urine appears to be "invariably dependent upon some imperfection in the excretion of carbon by the

organs, whose special function it is to eliminate this element from the blood, as the liver and lungs, but especially the former. It is hence almost always connected with some functional or structural mischief of the liver or spleen, or some other organ connected with the portal circulation." I have for many years ascribed the presence of this colouring substance in the urine to an increased waste of the red globules of the blood, or of the hæmato-globulin by the kidneys, and that the diseases in which it most remarkably occurs, as fevers, gout, acute rheumatisms, phthisis, &c., are characterised not only by a rapid waste of the tissues, but also of the globules of the blood, giving rise in most cases to marked anæmia. There can be no doubt of biliary disorder, torpor, &c., of the liver,—enlargements of the spleen, &c., being often associated with these and other diseases in which purpurine exists in the urine; but, in these, the waste of the blood-globules is not the less remarkable, this substance disappearing from the urine when the waste is diminished to the natural amount by restoration of vital power, by due oxygenation of the blood, and by improved digestion and assimilation.

57. v. Cystine, its pathological Relations.—This substance does not exist in healthy rine, and rarely occurs in morbid urine. It is probably derived from the sulphur extractive of urine (§ 30.). In its chemical composition it contains no less than 26 per cent. of sulphur. Cystine, Dr. G. Bird states, has been found in urinary sediments by very few observers, and it was not recognised in this form until a long period after its discovery in calculi by Dr. Wollaston. In the rare cases in which it has been observed, it formed a nearly white or pale fawn-coloured pulverulent deposit, resembling pale urate of ammonia. The greatest proportion of cystine may be inferred to be merely diffused in the urine whilst in the bladder, as at the moment of discharge the urine is turbid, and immediately deposits a copious sediment. Dr. G. Bird states that, on applying heat to the urine, the deposit undergoes no change, and very slowly dissolves on the subsequent addition of hydrochloric or nitric acid. "Pure cystine is soluble in the mineral, and insoluble in the vegetable acids; with the former, it forms imperfect saline combinations, which leave by evaporation gummy masses or acicular crystals. It is readily soluble in ammonia and the fixed alkalies and their carbonates, but insoluble in carbonate of ammonia. Heated on platina foil it burns, evolving a peculiar disagreeable odour." Cystine may be distinguished from a deposit of urate of ammonia by not disappearing on heating the urine, and from the earthy phosphates by being soluble in very dilute hydrochloric or strong acetic acid. "The best character of cystine is its ready solubility in ammonia, mere agitation of some of the deposit with liquor ammoniæ being sufficient to dissolve it; and a few drops of the fluid, when allowed to evaporate spontaneously on a slip of glass, leaves six-sided tables of cystine. The ammoniacal solution, when kept for some time in a white glass bottle, stains it black, from the combination of the sulphur of the cystine with the lead in the glass."

58. *a. The Character of Urine depositing Cystine* is that of a pale yellow, or more of a honey-yellow than of an amber tint, presenting an appearance like diabetic urine. It is below the average specific gravity, is passed in larger quantity than usual, and is often neutral, seldom acid to litmus paper, and soon becomes alkaline. The odour of this urine is peculiar, and resembles that of sweet-briar. It is more rarely fœtid, and when it is, the colour is generally greenish, or greenish-yellow. "A certain portion of cystine exists in solution in the urine, as the addition of acetic acid always precipitates a small quantity." Even when this deposit has vanished, for some days together, crystals of cystine are then precipitated by acetic acid. Urea and uric acid are present in very small quantities, and in some instances the latter is nearly absent.

59. *b. Calculi* composed of cystine are generally pale yellow or fawn-coloured; but by long keeping they become greenish-grey, or a fine greenish-blue, probably owing to the action of light. The *microscopic characters* of cystine are very obvious. When it occurs as a deposit, it is always crystallised, never being amorphous. Among the crystals, a few regular six-sided laminæ are often seen, but the great mass is composed of a large number of superposed plates, so that the compound crystals thus produced appeared multiangular; but I must refer the reader to Dr. G. Bird's work, where this topic is well illustrated by wood-cuts.

60. *c. The pathological Origin of Cystine* is no further known than that it is inferred to proceed from the waste of the tissues, and probably also, of the hæmato-globulin, or rather of some derangement of the normal course of this waste connected more especially with an excessive elimination of sulphur; every ounce of cystine containing more than two drachms of this element. Cystine may thus be formed from those elements of the tissues normally producing urea and uric acid with an excess of sulphur, owing probably to a deficiency of the process of oxidation in connection with impaired vital energy. That these latter states obtain is evinced by the occurrence of cystine, or cystin-uria, in scrofulous, chlorotic, and anæmied subjects. The hereditary nature of this condition of the urine has been noticed by Dr. G. Bird, who states that in one family alone, several members were affected with cystin-uria; and that one instance exists, in which it can be traced, with tolerable certainty, through three generations. In one case under the care of Mr. Luke, extensive disorganisation of the kidneys co-existed with a cystine calculus. Dr. Prout has seen fatty matter mixed with the urine in cystin-uria, and suggests the probability of its connection with fatty liver. Dr. G. Bird thinks it not unlikely that the excretion of cystine may be a means, under certain circumstances, of compensating for deficient action of the liver *quoad* the excretion of sulphur. The existence of cystine in the urine of chlorotic and debilitated females has been met with in several cases by Dr. Shearman of Rotheram.

61. *d. Indications of Cure.*—Dr. Prout advises the prolonged use of nitro-hydrochloric acid, and found it of benefit in some cases. Having viewed the existence of cystine in the urine as a result of debility in connection with imperfect oxidation of the blood-globules, I have in one case prescribed the chlorate of potash with tonic infusions. This view of the pathology of cystine is suggestive,

also of the employment of the tincture of the chloride of iron, of the iodide of iron, of chalybeate mineral waters, and of other tonics, for its removal, aided by a generous diet, by active exercise in the open air, and by due attention to the functions of the skin and bowels. (See, also, the *Treatment of* Debility, of Chlorosis, and of Scrofula.)

62. vi. Hippuric Acid — Hippuria. — This acid is constantly present in the urine of the horse, and generally, also, in that of herbivorous animals. *a.* Lehmann found it in diabetic urine, and Liebig detected it in healthy urine, although in minute quantity. As this substance never appears as a sediment until after the addition of a stronger acid, the *diagnosis* of it entirely depends upon the characters of the urine containing it. The urine containing an excess of hippuric acid is either very slightly acid, or neutral. It may be even alkaline. When this state of urine is caused by the ingestion of benzoic acid, it is then very acid. Its odour is commonly that of whey, and its specific gravity is below the healthy state, varying from 1·006 to 1·008. Deposits of the triple phosphate of magnesia are not infrequent in it. For the modes of detecting this acid, and for its microscopic characters, I must refer the reader to Dr. G. Bird's work.

63. *b. The pathological states* causing this state of urine are not always obvious. In the lower animals it proceeds from vegetable food, it being constant in such as are not exercised, and replaced by benzoic acid in those that are worked. When in excess in human urine, it is ascribable to diet; thus it has been found after a prolonged milk diet, after an excessive use of apples, and in the urine of infants. This acid does not necessarily interfere with the production of uric acid, but generally it is attended by a deficiency of urea. It has been found in urine containing albumen. Dr. G. Bird ascribes it to a diet deficient in nitrogen, or to the mal-assimilation of the carbon in the food, and infers "that hippuric acid may be one of the agents by which the kidneys perform a vicarious function for the liver, in removing an excess of carbon from the system." In this respect, it may be viewed as an analogous result to the production of purpurine and bile-pigment, each removing 63·93, 62·0, and 68·18 per cent. of carbon, respectively, from the system. It should be looked for in the urine when the functions of the liver, lungs, and skin are defective, when the food is deficient in nitrogen, and when the urine is copious, is slightly acid or neutral, and of low specific gravity.

64. vii. Oxalate of Lime—Oxaluria.— Oxalate of lime often exists in the urine, and is frequently a constituent of calculous concretions. Its chemical and pathological relations have been ably investigated by Dr. G. Bird, who contends for its frequent appearance as a crystalline deposit in the urine, in fine and well-defined octahedral crystals, and for "the connection between the occurrence of this substance and the existence of a certain series of ailments generally characterised by nervous irritability." He considers that the depressing influences, always present in densely populated cities, are more productive of this than of earthy phosphatic deposits; and that traces of oxalate of lime, in the minutest microscopic crystals, may be detected in the urine of persons free from any apparent disease. Hence he regards it as one of the common results of metamorphosis of tissue. But this is very different from its presence in large crystals and in considerable quantities, these constituting a truly pathological condition.

65. *a.* For the *Detection* of oxalate of lime in the urine, I must refer to the work already quoted for the full details: generally, however, the existence of this substance may be ascertained by pouring off the upper six-sevenths of the water passed a few hours after a meal, having given it time to repose in a glass vessel. A portion of the remaining seventh may be warmed in a watch-glass to dissolve the urate of ammonia. Having removed the greater part of the fluid, and replaced it by distilled water, a white glistering powder like diamond dust now becomes visible; and this under the microscope will be found to consist of crystals of oxalate of lime in transparent octahedra, with sharply defined edges and angles. Dr. G. Bird states that, out of a great number of specimens of urine containing the oxalate, it has scarcely ever appeared in the form of a distinct deposit, but has remained diffused in the urine, even when present in so large a quantity that each drop, when placed under the microscope, was loaded with its crystals. But if any substance capable of being a nucleus were present, the oxalate would be deposited around it, although scarcely in cohering masses, and invariably colourless and beautifully transparent. The oxalate of lime, although absolutely insoluble in water, must be soluble in urine; for its lustrous crystalline form sufficiently indicates its previous solution, and it is not until after the urine has been voided several hours that the crystals of oxalate can be detected.

66. Occasionally some remarkable crystals of the oxalate resembling *dumb-bells*, or two kidneys with their concavities opposed, are met with, their surfaces being finely striated. But it is doubtful whether or no these are an oxalate of lime. Dr. G. Bird considers them an oxalurate of lime, a salt which differs from the oxalate in ultimate composition only in the presence of the elements of urea and absence of the constituents of water. Dr. Bacon has investigated these crystals minutely, and has concluded that the dumb-bell crystals consist of a "salt of lime containing either oxalic, oxaluric, or, perhaps, some other organic acid easily converted into oxalic acid; but the exact nature of the acid remains to be determined by future examination."

67. *b. The Characters of urine* containing the oxalate of lime are those of a fine amber hue, sometimes darker than in health, in a few cases paler than natural, and of a lower specific gravity, the odour being generally natural or rarely aromatic like mignonette. Frequently a deposit of urate of ammonia, sometimes tinted pink by purpurine, falls during cooling. The specific gravity of oxalic urine varies extremely. Of 85 different specimens, Dr. G. Bird found 9 in which it ranged from 1·009 to 1·015; — in 27 from 1·016 to 1·020; — in 23 from 1·021 to 1·025; — and in 26 from 1·025 to 1·030. Generally the heaviest specimens contained most of the oxalate. The quantity passed seldom exceeded the average; instances of positive diuresis being rare. Irritability of bladder was sometimes complained of.

Acidity of the urine was well marked; even more so than in health, and always present. An increase in the quantity of urea was frequently found. Mr. STALLARD discovered in oxalic urine a great increase of the indeterminate organic matters (§ 21.), often as much as double the average proportion in twenty-four hours.

68. *c. The Complications of oxalate of lime with other deposits* are of some importance. Dr. G. BIRD found the oxalate of lime unmixed with any other saline deposits in more than one half of the specimens of oxalic urine. "In a very few, crystals of uric acid were found from the first, mixed with the octahedra of oxalate of lime; and in nearly all the successful cases, this acid appeared in the course of treatment, and ultimately replaced the oxalate altogether," at a period generally contemporary with convalescence. "Much more rarely, prisms and stellæ of the ammoniaco-magnesian phosphate were found mixed with the oxalate, and occasionally replacing it in the course of treatment; and still less frequently, the phosphate was observed in the urine some time before the appearance of the oxalate." Very few well-marked instances of a complication of the oxalic-acid urine with granular degeneration of the kidneys were observed. Of the 85 cases referred to above (§ 67.), 43 were unmixed cases of oxalate; 15 were cases of oxalate mixed with urate of ammonia; 15 were mixed with uric acid; 4 were mixed with triple phosphate; and 8 with phosphate deposited by heat. Dr. G. BIRD constantly found a very large quantity of epithelial cells and scales in oxalic urine, indeed so constantly, that a white deposit of epithelium led to the suspicion of the presence of oxalate of lime.

69. *d. The Pathological Source of oxalate of lime* in the urine is of great interest. It is well known that a physiological connection exists between sugar and oxalic acid; that the former substance is a common constituent of our aliments; and that most of the farinacea are partially converted into this substance during digestion. Under certain circumstances the sugar thus formed is carried into the blood, and is eliminated by the kidneys. In certain morbid states, a large proportion of the food may be converted into sugar in the stomach, which passes rapidly into the circulation, and is excreted by the kidneys as diabetic urine. Recollecting the facility with which sugar and its chemical allies are, under the influence of oxidising agents, converted into oxalic acid, it might be inferred that the existence of oxaluria is due to the presence of sugar in the blood. Dr. G. BIRD, however, argues against any connection or relation subsisting between oxaluria and diabetic urine, inasmuch as sugar very rarely exists in the former; and as the latter rarely contains, in a given quantity, an excess of urea, uric acid, or urates, and is remarkably free from saline deposits, the high specific gravity depending upon the large proportion of sugar. In oxaluria, on the other hand, a large excess of urea, of uric acid, and urates is present, and is as characteristic of this state of urine as the oxalate of lime itself. Hence he infers that there is no relation between oxalic acid and saccharine urine. From the symptoms present in cases where oxaluria is observed there can be no doubt that the primary cause of this state of urine must, as Dr. PROUT has shown, be imputed to an unhealthy condition of the digestive and assimilating functions. That the oxalic acid is formed from its elements, either in the digestive canal or in its course to and in the blood, must be inferred, since Dr. GARROD detected, beyond any doubt, octahedral crystals of oxalate of lime in the serum of blood from a patient affected with albuminuria. "It is difficult to explain the presence of so insoluble a salt in solution in the blood; but it is probable that the opinion of Dr. SCHMIDT, of Dorpat, may be correct. He has assumed that there exists in the animal economy a tendency to the formation of a soluble triple compound of oxalic acid, lime, and albumen, which, by its decomposition allows oxalate of lime to crystallise." Probably such a compound exists in the blood in disease; and when the acetic acid is added as in Dr. GARROD's process, the albumen is separated and the oxalate set free.

70. The chemical relation existing between uric acid, urea, and oxalic acid, and the readiness with which the former of these substances is convertible into the latter, suggest the idea that oxaluria may be regarded as a form of what has been termed by Dr. WILLIS *azoturia*, of which an excess of urea is the prevalent indication, part of the urea, or of its elements, having been converted into oxalic acid. It may be inquired, Whence are the elements which form oxalic acid? Are they derived from the metamorphic changes of the structures, like healthy urea and uric acid? Dr. G. BIRD infers that they are. "Hence oxalate of lime must be regarded as one of the common results of metamorphosis of tissue" (*Op. cit.* 210.). I am more disposed to agree with the opinion he has subsequently stated, viz. that, although it is probable that such may be the origin of oxaluria (in the waste of the tissues), yet, the quantity of oxalate of lime being greatest after a full meal, and often absent in the urine passed in the morning, frequently disappearing when the diet is regulated, and reappearing on the use of unwholesome food, it is equally probable that this salt is derived from the mal-assimilated elements of food. It is sufficiently obvious, from the nature of the complaints in which oxaluria occurs, that it is always the result of imperfect assimilation of the aliments, owing to impaired organic nervous power, the mal-assimilated or rather the non-assimilated elements forming the product in question, aided by oxidation, which product is rather eliminated, than formed, by the kidneys. However minute and laborious may be the researches of organic chemists in endeavouring to show the elementary combinations and the atomic affinities of these elements, in the production of urinary deposits, the vital endowment, and the states of function depending upon this endowment, more especially demand attention; the chemical constitution of the urine being generally only a sign, but an important one, of the state of this endowment, particularly as manifested by the organic nervous system.

71. *e. The Symptoms accompanying the excretion of oxalate of lime* have been minutely described by professors of the urinary speciality; and conformably with the importance they attach to an urinary deposit, they view it as the actual disease, or at least as a diathesis, instead of being merely a sign, or at most a result, of pre-existing

disorder or disease, to which, more especially, rational medication should be directed. Oxaluria is not a sign of one or even of two disorders merely, but of several, the chief morbid manifestations being depressed vital endowment of the digestive and assimilating organs, with lowness of spirits, irritability or nervousness, hypochondriacal feelings, impaired nutrition, anæmia, and often loss of sexual power. Pains in the loins, irritability of bladder, and high specific gravity of the urine — generally from 1·025 to 1·030, — with various symptoms of impaired health, are also commonly experienced. The urine is invariably acid, often excessively so; and there is a marked tendency to eruptions of boils. Dr. G. Bird remarks that he has seldom met with phthisis in cases with oxalate of lime deposit, and that in very few instances has he seen oxaluria terminate in the formation of a calculus. He again states that the source of this deposit is to be imputed to metamorphosis of the tissues, and that this is the only way that the attending emaciation can be satisfactorily accounted for. I have already stated my belief that this deposit as well as the emaciation are the results of impaired or morbid assimilation of the food, and the consequent imperfect nutrition of the tissues (§ 70.).

72. *f. Causes.*— This state of the urine is frequent in those who are subject to mental anxiety and to laborious mental occupations, more especially in men on the stock-exchange, in medical men, in barristers and solicitors, and in those who are engaged in occupations attended by much mental anxiety, and are excessively devoted to business or study. The *exciting causes* are chiefly neglect of health, chronic dyspepsia, hypochondriasis, exhaustion from disease, from syphilis or mercurial courses; venereal excesses, masturbation, involuntary seminal emissions, excessive discharges, and prolonged lactation, previous acute diseases, injuries affecting the spine, &c.

73. *g. The Treatment of oxalate of lime deposits* is generally successful, if the diet and the regimen of both mind and body be duly regulated. The food should be digestible, properly cooked, and the animal and vegetables in due proportion. Malt liquor ought to be avoided; and either a small quantity of brandy in much water, or a glass of dry sherry in two of water, may be taken with dinner. The medicines most appropriate are the nitric or nitro-hydrochloric acid (one part of the nitric to two of the hydrochloric) given in tonic infusions or decoctions. If anæmia or chlorosis exist, the tincture of the muriate of iron, with preparations of calumba or quassia; or the mistura ferri composita, or the ammonio-citrate or ammonio-tartrate of iron, should be prescribed. If the bowels be costive, the extract of taraxacum may be given with the former medicines; or the decoction of aloes be conjoined with the mistura ferri composita; or the mistura gentianæ composita may be given alone, or with tincture of serpentaria, &c. The sulphate of iron, or of quinine, or of zinc may be prescribed, where the foregoing fail, combined with small doses of camphor and henbane, or of conium. Dr. G. Bird recommends recourse to colchicum for oxaluria, and states that, under the influence of this drug, copious deposits of oxalate of lime have become replaced by uric acid and the urate of ammonia, thus inducing a condition of urine much more amenable to treatment.

74. viii. CHEMICAL PATHOLOGY OF EARTHY SALTS IN THE URINE.—*Phosphuria.—Phosphate of Lime, Ammonio-phosphate of Magnesia, and Carbonate of Lime.*—Phosphoric acid is excreted in considerable quantity from the blood by the kidneys, combined with soda, ammonia, lime, and magnesia; forming, most probably, ammonio-phosphate of soda, phosphate of magnesia, phosphate of lime. The first of these is soluble in water, and Dr. G. Bird considers it to be the solvent of uric acid, and indirectly the source of the acidity of urine. The other two salts are insoluble, but the presence of a minute portion an acid, even the carbonic, enables water to dissolve a considerable quantity. They are also soluble to some extent in hydrochlorate of ammonia. "In healthy urine, the earthy phosphates are held in solution by the acid of the superphosphates, produced by the action of uric (or hippuric) acid on the tri-basic alkaline salts; and these salts are also, according to Enderlin, capable of dissolving a certain quantity of phosphate of lime." The earthy phosphates are always abundant after a meal, the reverse applying to the alkaline salts. Phosphoric acid may be excreted in large excess without forming a deposit, owing to its combination with an alkaline base; and hence, when the excretion of an excess of this acid is looked for, it is not indicated by the amount of earthy salts deposited, for there "is always three or four times more phosphoric acid in a given specimen of urine, in the form of a soluble alkaline salt, than is precipitated as an insoluble earthy compound. The presence of an excess of lime and magnesia has more to do with determining a deposition of insoluble phosphate, than an excess of phosphoric acid." The circumstances under which the earthy phosphates are deposited often are of so great importance as to require a recognition of their existence, as well as of the quantities of these phosphatic deposits.

75. *A. The Diagnosis of Earthy Phosphates.* — *a.* Deposits of these phosphates are white, unless coloured with blood, are soluble in dilute hydrochloric acid, and insoluble in liquor potassæ and in ammonia. On heating the urine, the deposit merely agglomerates into little masses. A small quantity of a solution of sesqui-carbonate of ammonia added to a large quantity of healthy urine causes turbidity, from a deposit of the triple phosphate mixed with some phosphate of lime. "On placing a drop of this turbid urine under the microscope, myriads of minute prisms of the triple salt, mixed with amorphous granules of the phosphate of lime, will be seen floating in the fluid; these disappear on adding a drop of any acid. As these earthy salts are insoluble in water, they must be held in solution in the urine by the free acid which generally exists. If from any cause the quantity of solvent acid falls below the necessary proportion, the earthy phosphates appear diffused through the urine, disturbing its transparency, and subside, forming a deposit. Hence, whenever the urine is alkaline, phosphatic deposits are necessary consequences. If urine be secreted with so small a proportion of acid as barely to redden litmus paper, a deposit of triple phosphate often occurs within a few hours after emission;" probably owing to the presence of

mucous matter, which induces the decomposition of urea and the formation of carbonate of ammonia, which, by neutralising the solvent acid, precipitates the phosphates. The triple phosphate, which occurs spontaneously in prismatic crystals, is a neutral salt, "and may *coexist as a deposit with very sensible acidity* of the supernatant urine. It by no means follows that the existence of a deposit of this salt involves the necessarily alkaline state of the urine." Another triple phosphate, differing from the former in containing an excess of base, is of frequent occurrence in the urine when in an alkaline or putrescent state. It cannot be present in urine having the slightest acid reaction on litmus paper. Its crystals are invariably stellar or foliaceous. This salt is termed the basic phosphate. "When the triple or calcareous phosphates are separately exposed to the heat of a blow-pipe flame, they fuse with great difficulty, and not until the heat has been urged to the utmost. If, however, the phosphate of lime is mixed with a triple phosphate in about equal proportions, they readily melt into a white enamel. These mixed salts constitute what is hence termed the fusible calculus, and they can readily be detected by this property in concretions; a character very available in the examination of gravel and calculi, as the two phosphates generally occur together."

76. *b.* The *Physical Appearance* of deposits of the earthy phosphates varies remarkably. Sometimes they appear as a white crystalline gravel, especially when the triple salt is the chief part of the deposit. But if a small quantity be present, it may readily escape detection by remaining a long time diffused in the urine. After a repose of a few hours, some of the crystals collect on the surface, forming an iridescent pellicle, "reflecting coloured bands like a soap-bubble or a thin layer of oil. If then the lower layers of the urine be placed on a watch-glass, and held obliquely over the flame of a candle or any strong light, a series of glittering points will become visible from the reflection of light from the facets of the minute prisms of the salt." (*Op. cit.* p. 269.)

77. The phosphates often subside to the bottom of the vessel like a dense cloud of mucus, for which they may be mistaken. Sometimes they form, in very alkaline urine, dense masses, hanging in ropes, like the thickest puriform mucus, from which it is impossible to distinguish them by the unaided eye. Their disappearance on the addition of hydrochloric acid shows at once their nature. The examination of a few drops of the urine between two plates of glass, by the microscope, will detect the characteristic crystals of the phosphates. Occasionally they are mixed in a deposit with the urate of ammonia, this latter being pale or nearly white. As phosphatic urine is usually very pale, it follows that any urate of ammonia deposited from it will be nearly white from the absence of colouring matter.

78. *c. States of Phosphatic Urine.* — Although it may appear necessary for the urine to be alkaline for a deposit of phosphates to exist, yet generally urine which deposits the triple phosphate is acid at the time of its excretion. Some neutral salts redden litmus paper, and yet contain no free acid; and this fact may in some cases explain the occasional acid reaction where deposits of phosphates exist. Dr. O. Rees has shown that hydrochlorate of ammonia may in some cases be the solvent of the earthy phosphates when in excess. Occasionally urine does not contain any visible deposit, and yet on the application of heat appears to coagulate from the deposition of earthy phosphates. The addition of a drop of nitric acid immediately dissolves this deposit, and distinguishes it from albumen. The precipitation of the earthy phosphates by heat has been ascribed by Dr. H. Bence Jones—

79. Generally where phosphatic deposits, magnesian, calcareous, or both, exist for a considerable time, the urine is pale, often whey-like, passed in large quantities, and of low specific gravity—from 1·005 to 1·014. "This is especially the case where organic lesion of the kidneys exists." On the other hand, when the deposits recur and disappear in the course of a few days, the urine is generally of a deep amber colour, is of high specific gravity (from 1·020 to 1·030), often contains an excess of urea, and presents an iridescent pellicle on its surface by repose. This form of phosphatic urine is often met with in connection with irritative or inflammatory dyspepsia and with mal-assimilation. Sometimes prisms of triple phosphate are seen entangled in the meshes of a mucous cloud for a day or two, and then disappear. Phosphatic urine occasionally varies from a whey-like hue to a deep brown or greenish brown, is very fœtid, generally alkaline, "and loaded with a dense ropy mucus often tinged with blood, and in which large crystals of the triple phosphate and amorphous masses of phosphate of lime are entangled. This variety is almost always met with, either under the irritation of a calculus, or even of a catheter worn in the bladder," or where actual disease of the mucous coat of this organ exists.

80. *d.* For the *microscopic characters* of earthy phosphates, I must refer to Dr. G. Bird's work, where they are fully illustrated. I can only mention — 1st, *the prisms of neutral triple phosphates*; these are well defined, the triangular prism being the form most frequently met with, but it presents every variety in its terminations; — 2nd, *simple stellæ of the neutral salt*, the radii being more or less distinct or crowded;—3rd, *penniform crystals of neutral salt*; this variety presents the appearance of striated feather-like crystals, two being generally connected resembling a pair of wings; — 4th, *stellar and foliaceous crystals of basic salt*; this variety is chiefly formed after the urine is discharged, and, when rapidly formed, it generally appears as six-rayed stars, each ray being serrated. —*Phosphate of lime* generally presents no appearance of crystalline structure; it either resembling an amorphous powder, or being collected in rounded particles, often adhering to prisms of triple phosphate.

81. *B. Pathological Relations of the Phosphates.* — I have many years ago contended, and more recently, in various parts of this work, alluded to the fact, that *the secretions* are endowed, to a certain extent, with an emanation of vitality,

which, for a time, resists the changes which they are disposed to enter into either when organic nervous influence is much depressed or when they are removed from the body. "Indeed, the vital influence modifies their physical conditions, in a more or less marked manner, as long as they continue subjected to its operation. From this source, also, they are imbued with a vital emanation, the presence of which is indicated by the continuance, for a time, of the specific characters of each. This emanation, being no longer required when they are removed from the body, is soon dissipated. The secretions, while within the sphere of the animal system, and for a short time afterwards, possess this emanation of the vital influence, to an amount sufficient to give them certain characters, and to preserve them from the chemical changes to which their constituents are naturally prone; but when this influence becomes depressed, or ultimately ceases, they then undergo dissolution as unequivocal as that evinced by the textures of the body. In confirmation of this view, I need only refer to the comparative conditions of the more perfectly elaborated secretions immediately after their formation and excretion, and after periods of various duration have elapsed from the time of their discharge from the body." (*Physiol. Notes by the Author*, p. 636.).

82. The above doctrine was published by me in 1824; and both then and subsequently I have insisted upon its importance, and upon the obvious deductions which follow from it. Whilst vital energy is perfect, or at least not materially impaired, the secreted fluids, especially whilst they remain undischarged from the body, are preserved by this emanation of vital influence from those changes to which their constituents are chemically disposed. But if these fluids are retained for an unusually lengthened period, or if vital energy, to which they owe their original natural character, be much impaired, those changes which their constituents are chemically disposed to undergo, take place more rapidly after their discharge from the body, and in many instances even whilst they still remain in those receptacles or cavities which are provided for their reception and temporary retention. But with the various manifestations of depressed vital power, changes in the secretions are not only such as take place after these secretions are produced, but also those which occur during their production, and which depend upon the existing state of vitality throughout the body, and upon the manifestations and modifications of vitality in the organs especially destined to the formation of these secretions. When vital energy is impaired, or, in other words, when debility is manifest, whether constituting the only or chief pathological condition or associated with others, as with nervous susceptibility or irritability, or with febrile action, or with organic change, or with other alterations farther impeding or disturbing the functions of a secreting organ or organs, results will be furnished by the secretions varying with the manner in which the general impairment of vital power affects the functions of digestion, assimilation, nutrition, and waste—the successive conditions of nutritive supply, of vital cohesion and resistence, of molecular dissolution, of vascular depuration, and of ultimate discharge.

83. This doctrine, which, as I have shown, has been published and taught by me with reference especially to the several secretions and excretions — recrementitious, excrementitious, or depurating — is altogether applicable to the urinary excretion, and to the deposits which form in it, both after and previous to its discharge from the body, and in a more particular manner to the urine which furnishes the phosphates in great or unusual excess. The deposit of earthy phosphates may be viewed as resulting more especially from depression or exhaustion of vital power, as manifested chiefly by the nervous system, and is hence most frequently met with in the aged, and in those who labour under disease of the cerebro-spinal nervous system, or have experienced injury of the spine, or have suffered much from tear and wear of mind and body. The pathological conditions giving rise to the deposits of phosphate of lime, are similar to those producing the triple salt. Indeed, they often occur simultaneously, especially when the urine is alkaline. Dr. G. BIRD considers that, when the deposit has consisted chiefly of the calcareous salt, the patients have presented more marked evidence of exhaustion, and of the previous existence of some drain on the nervous system, than when the triple salt alone existed, unless its source is strictly local.

84. When the triple phosphate occurs in small quantities, nearly or quite free from the phosphate of lime, the urine being acid or neutral at the time of emission, the cases are then the slightest of this class of disorders. Nevertheless, severe dyspepsia, irritability, restlessness, impaired assimilation and emaciation are constantly present. When there is an excessive discharge of urea, the symptoms are more severe, and the exhaustion and nervous depression greater. The urine is then of a rich amber colour, generally depositing phosphates on the application of heat, and of a specific gravity varying from 1·025 to 1·030. In mild cases of dyspepsia, especially in the gouty diathesis, an iridescent pellicle of triple salt, the urine being rich in urea and either acid or neutral, is often observed. This state of the urine is not infrequent in dyspeptic females at or about the climacteric period. Crystals of the triple salt occur in very old persons, especially in the ill-fed; in persons recovering from acute diseases, especially from rheumatic fever.

85. Early in continued fever the urine is high-coloured, and loaded with uric acid and urates. It is then generally acid; but after the end of the second week, or earlier, in the lower types of fever, the acidity often vanishes, and the urine becomes *alkaline* and deposits the phosphates. This is, however, more frequently seen in some types and states of fever than in others, especially in the typhoid and putro-adynamic, and when comatose symptoms appear. The treatment, particularly the use of alkaline medicines, or of the salts of the vegetable acids, has some influence in favouring the change to an alkaline state of the urine. In these cases, as well as in other diseases where the nervous energy is remarkably depressed or exhausted, more especially in the low forms of insanity, in cases of debility from venereal excess, masturbation, &c., after injuries of the spine, as remarked by PROUT, BRODIE, and others, the elements of urea become re-arranged, or obedient to ordinary chemical affinities, and form carbonate of ammonia.

86. When the deposit of phosphates is copious

the two phosphates are generally mixed, either falling to the bottom of the vessel, or remaining suspended in the urine like mucus; the urine is then generally alkaline, and the odour ammoniacal or fœtid. This kind of urine is most remarkable in organic disease of the urinary organs, or serious affections of the spinal chord followed by such disease. Conformably with the doctrine above insisted upon (§§ 81—5.), the impaired vitality of these organs depending upon depressed vitality of the frame generally, as in typhoid and putro-adynamic fevers, or of the urinary organs especially, as after injuries or diseases of the spine, its chord, &c., so affects the urinary secretion, both during the performance of this function, and whilst the secretion is retained, as to favour the occurrence of those changes, even before it is discharged, which its ordinary chemical affinities dispose it to assume. The change thus produced in the urine, may be followed by the formation of calculi in any part of the urinary apparatus, but most frequently by irritation of the urinary mucous surfaces and by the secretion of a quantity of viscid mucus, which may become puriform or changed, by the carbonate of ammonia formed in the urine, into a viscid and almost gelatinous or tenacious ropy fluid, sometimes preventing the discharge of the urine, and increasing the sufferings of the patient. Mr. Curling's view of this subject is different from that now stated. He believes that the result of the spinal lesion is the loss of the natural sensibility of the bladder. The effect of this is the secretion of unhealthy alcalescent mucus, which acts chemically upon the urine, renders it alkaline, and leads to the deposition of the earthy phosphates. He thinks that the urine may subsequently be secreted in an alkaline state by the extension of the irritation from the bladder to the kidneys, or by the latter sympathising with the former. It should not, however, be overlooked, that injury of the spine not only deprives the urinary apparatus of that share of nervous power reinforcing the organic or ganglial nervous influence which endows this apparatus, but thereby also modifies the secreting function of the kidneys. Whether the result be impairment only, or a modifying action also, there can be no doubt that the chief result of these injuries is paralysis of the bladder, especially as respects its contractile powers, causing retention of the urine, which, whether it be secreted in an altered or morbid condition, or rendered such after its secretion, owing to impaired vital influence, more readily irritates the urinary mucus surface, than in its healthy state, and gives rise to mucous discharge and the consecutive lesions of the urinary organs.

87. The urine may be alkaline and loaded with phosphates owing to disease of the *Urinary Bladder* (see that article), more especially of its mucous surface. This state of the urine thus arises from three important pathological conditions: — 1st, from vital depression, as manifested chiefly by nervous debility and irritability;—2nd, from injuries and diseases implicating the spinal chord or its membranes; — 3rd, from disease of the urinary organs. But it should not be overlooked that the second condition affects the urine by first disordering the functions and subsequently the structure of these organs. It is important to be able to distinguish between these sources of alkalinity of the urine, especially between the presence of a general morbid condition, and a strictly local disease. Dr. Bence Jones has established, that urine is alkaline from ammonia when the cause is local, and from a fixed alkali when the ailment is general. Hence urine may be alkaline, and not ammoniacal, although when the latter it is necessarily the former. The urine is sometimes alkaline after breakfast, owing to the presence of a fixed alkaline carbonate. The urine, in such cases, turns red litmus paper blue, whatever may be the alkali present; but, if it be a fixed alkali, the paper remains blue after being dried before the fire; but if it be the volatile alkali, the paper resumes its red tint when thus exposed. When the urine is alkaline from ammonia, Dr. B. Jones has further shown, abundant crystals of triple phosphate are always found, whilst, when ammonia is absent, these crystals are rarely present, and are replaced by a copious and dense deposit of phosphate of lime. He has arrived at the following conclusions as to the relation borne by phosphatic salts to certain pathological states:—

88. 1st. No determination of an excessive secretion of phosphatic acid can be furnished by the deposit of earthy salts, unless the quantity of lime and magnesia in the food be taken into account; — 2nd. No *real increase* of phosphatic salts occurs in spinal diseases, notwithstanding the existence of deposits;—3rd. In fever and in most acute inflammations, the phosphatic salts are not increased; — 4th. In old cases of mania, melancholia, paralysis of the insane, or in chronic diseases in which nervous tissues are uninfluenced, no conclusions can be drawn; — 5th. In fractures of the skull, the phosphatic salts increase only when any inflammatory action occurs in the brain, and in acute phrenitis an excessive increase takes place;—6th. In delirium tremens there is a marked deficiency of phosphates, unless they are introduced with the ingesta; an excess is, however, met with in some functional affections of the brain.

89. In some instances the urine is copious, pale, and freely deposits the phosphates, the patient being emaciated, and the urinary organs free from disease. In these the formation of a calculus may be dreaded. But when this does not exist, it will often be found that tabes dorsalis from masturbation is the cause both of the constitutional and of the urinary disorder. Dr. Golding Bird states, that the deposits of phosphates, where no organic disease exists, are often absent, not only for hours but for days together; and this fact will often indicate a favourable termination of the case; and he comes to the following conclusion: — "that, where the presence of a deposit of phosphates is independent of the irritation of a calculus, or of organic disease, it is most abundant in the urine passed in the evening, and absent or replaced by uric acid, or urates, in the morning, the urine being always of a tolerably natural colour, never below, and often above the mean density. Where the presence of phosphatic salts depends upon the irritation of a calculus, or upon organic mischief in the urinary passages, the urine is pale and whey-like, of a density below the average, often considerably so, and the earthy deposit is nearly equally abundant in the night and morning urine." (*Op. cit.* p. 293.)

90. *C. Therapeutical Indications.* — *a.* When phosphatic deposits depend upon *irritative dyspepsia*, or upon *nervous or febrile disorder*, in-

dependently of affection of the spine or of the urinary organs, the treatment should be directed rather to the constitutional, digestive, and assimilative disorders, than to the state of the urine, which ought to be viewed only as a symptom. In these cases, depression of spirits, hypochondriasis, and various dyspeptic symptoms are present; and the urine has a high specific gravity, contains an excess of urea, and deposits crystalline or amorphous phosphates. In these the urinary deposits should be viewed as the results of defective vital and nutritive powers, and as exhausting the nervous energy; and the treatment ought to be directed to the functions of the stomach and bowels, and to the improvement of the general health, by means of stomachic or tonic aperients, by a light, digestible, and generous diet, and by bitter infusions or decoctions. To remove the more painful symptoms, the oxide of bismuth or of zinc may be given with the extract of ox-gall, and the extract of henbane or the pil. saponis composita. In these cases, the means advised in the articles DEBILITY, HYPOCHONDRIASIS, INDIGESTION, &c., will generally be appropriate.

91. *b.* When the *phosphatic deposits* depend upon *exhaustion or injury of the spinal chord*—upon tabes dorsalis, &c., then the medical means require modification. In these, great emaciation, copious phosphatic deposit, the phosphate of lime predominating remarkably, pain and weight in the lumbar region, copious pale urine and low specific gravity, and dryness of the skin, require not only the restoratives and tonics already advised, but also a recourse to opiates conjoined with aromatics, diaphoretics, &c. When these cases proceed from a blow or other injury of the spine, or wrench of the back, then the terebinthinate liniments or embrocations along the spine (see Form. 296, 311.), the cold salt-water douche on the loins, followed by frictions or liniments, the emplastrum roborans, &c., will be of great service. In many of these (especially when caused by masturbation) the preparations of iron, the nitro-muriatic acid in tonic infusions, the tincture of sumbul or of musk, or of serpentaria, with tincture of opium, are severally productive of more or less benefit. In mild and prolonged cases of this kind, a calculus is not infrequently insidiously formed in the pelvis of the kidney. For these, the mineral acids have been recommended, as they hold the phosphatic salts in solution: of these nitric or nitro-muriatic acid may be preferred; but it has been doubted whether they reach the kidneys, or act upon the deposit. However, when given judiciously or conjoined with bitter tonics, they improve the general health, and thereby either prevent or arrest the increase of the deposit.

92. *c.* When *phosphatic deposits proceed from lesion of the urinary organs*, their connection with a morbid secretion from the mucous membrane of the bladder is well known. The disposition of the phosphates to adhere to this surface generally increases the difficulty of treatment. For this state of phosphatic cystitis, weak acid injections into the urinary bladder have been advised, in order to wash away the phosphatic formation. A few drops of the hydrochloric acid, with as many of the vinum opii in tepid barley-water, may be injected daily. Dr. G. BIRD advises, in almost every case where phosphatic alkaline urine exists, to wash out the bladder by injections of warm water. (See also the treatment of *muco-cystitis* in art. URINARY BLADDER, §§ 89—97.).

93. IX. DEPOSITS OF CARBONATE OF LIME.— Carbonate of lime sometimes occurs in small proportions in deposits of earthy phosphates, when the urine is decidedly alkaline, owing to the decomposition of phosphate of lime by the carbonate of ammonia which replaces the urea. Its appearance is that of an amorphous powder; and its presence may be recognised by the addition of any dilute acid, which dissolves it with effervescence; but the deposit should be previously washed to deprive it of any adherent carbonate of ammonia.

94. X. DEPOSITS OF BLUE OR BLACK MATTERS. — Certain colouring matters, communicating to the urine a blue or black tint, the products of diseased action, are met with on rare occasions. Three blue pigments, viz., cyanourine, indigo, and percyanide of iron; and two black, melanourine and melanic acid, have been distinguished. These colours as well as green have been mentioned by many of the older writers noticed in the *bibliography;* and have doubtless been owing to the presence of blood or bile altered by the urine. — (*a*) *Cyanourine* was discovered by BRACCONNET, and noticed by several more recent observers. Urine containing it is of a deep blue colour, the colouring matter being deposited by rest, and readily separated by the filter. The origin of this substance, as well as its pathological indications, if any, are obscure, and merely furnish a subject of conjectural discussions to chemical pathologists.

95. (*b.*) *Indigo* is sometimes prescribed empirically in some diseases, as epilepsy; and it may thus pass into the urine, and form a blue deposit. PROUT and SIMON have shown that it may be generated in the œconomy, the urine acquiring a dark blue colour, and depositing a substance of the same hue, which, when collected on a filter, presents all the characters of indigo. The origin and pathological indications of this substance, when not taken internally, are unknown.

96. (*c.*) *Prussian blue, or sesqui-ferro-cyanide of iron*, has been found in the urine after taking the ferro-cyanide of potassium upon preparations of iron. It furnishes no pathological inferences.

97. (*d.*) *Melanourine and melanic acid* are black pigments which have been rarely met with in the urine. It is probable that they are merely the colouring matters of the blood altered by the state of the urine. Many years ago a clergyman in London, with whom I was well acquainted, experienced a dangerous immersion in the river, and was saved with difficulty. He soon afterwards began to pass black urine, for which I was requested to visit him. He complained only of a slight weight in the region of the kidneys. The urine was quite black, was passed in about the usual quantity, and was retained nearly the usual time. The lower extremities were not affected. A portion of the colouring matter was deposited, but the supernatant urine was not materially altered from its black colour. I attributed the colour to the escape of red globules of blood with the urine, owing to congestion of the kidneys, and their alteration by the state of the urine. Conformably with this view, I directed blood to be taken from the loins by cupping. The urine

afterwards resumed its healthy appearance, and no further complaint was made.

98 xi. Organic Deposits in Urine.—The deposits in the urine which have been noticed above are recognisable by their forms and chemical properties; those which remain to be mentioned, either possess, or have possessed, organisation, and can be distinguished only by an examination by means of the microscope, or of tests.

99. *A.* Blood and its Elements are often seen in the urine, and suggest important pathological and therapeutical indications. The urine may contain only the serum of the blood, or liquor sanguinis; or with this a considerable proportion of red globules; or it may contain a very large proportion of blood, hardly or not at all changed from its normal characters.

100. (*a.*) *Serous or albuminous urine* is readily indicated by heat, and by adding a drop of nitric acid, which coagulate the albumen contained in it. Urine containing much albumen is either free from, or contains but a very small amount of, colouring matter. The reddish urine in granular disease of the kidneys furnishes less albumen by heat than the straw-coloured. Nitric acid and a mixture of one part of nitric and three of hydrochloric acid, are more delicate tests of the presence of albumen than heat. Several sources of fallacy have been pointed out by writers which should not be overlooked when resorting to these tests;—1st. Heat will produce a white precipitate in urine containing an excess of earthy phosphates; but this will disappear on adding a drop of nitric acid, and distinguish it from albumen.—2nd. Nitric acid will produce white deposits in patients taking copaiba, cubebs, or other resinous substances; but heat has no such effect.—3rd. Nitric acid will, in some instances, produce a buff-coloured amorphous deposit in the high-coloured urine in fever, but heat does not cause this change.—4th. Albumen combined with alkalies does not coagulate by heat; therefore nitric acid should be used if the urine be alkaline.—5th. Albumen in an incipient state may not be detected by heat, but readily by means of the acids.

101. Albumen is sometimes found in the urine in a coagulated state, presenting a tubular vermicular appearance, being casts of the uriniferous tubules of the kidneys, often with portions of epithelium adhering to them; and, according to Dr. G. Johnson, loaded with fatty globules. These casts, when recently passed, appear like large hairs; but form after a time a dirty-white sediment, which a solution of potash gelatinises, and distinguishes from mucus. This deposit is pathognomonic of the changes which terminates in granular disorganisation of the kidneys.

102. *Blood* passed in considerable quantity in the urine, may either be more or less intimately mixed in the urine or it may have coagulated in blackish masses like pieces of black-currant jelly, linear masses like leeches being passed through the urethra with great suffering. In the former case the blood generally is poured out in the kidneys or their pelves; in the latter it is most frequently effused in the bladder. In either case the urine is always more or less coloured, often so deeply as to present a port-wine colour; the microscope showing some entire blood-globules, and others with their investing membrane broken down, and their coloured contents diffused in the urine. If the quantity of urine be small, the urine may appear like the washings of meat, or of a dirty or dingy hue, the red-globules being still recognisable by the microscope. The coagulation of the urine by repose seldom occurs: it is owing to the presence of fibrin, which, however, is very rarely effused without an admixture of blood-globules, giving the coagulum a reddish colour, or, of a fatty matter, imparting to it a whitish or opaline hue.

103. *Hæmatosine*, or the colouring matter contained within the sacs of the blood-globules, imparts to the urine a deepness of tint in proportion to the quantity of the colouring matter which has escaped from the sacs of the blood-globules, or rather to the number of these globules which are ruptured. Generally, however, the urine, when recently voided, contains some globules that remain entire; and, with the colouring matter, more or less albumen, which is affected, as shown above, by heat and nitric acid, excepting that the coagula are more or less brown owing to the presence of hæmatosine. When, however, the urine is much loaded with *purpurine*, or *uric acid*, or with *bile*, these may be mistaken for hæmatosine. The *first* of these will not be affected in colour or transparency by a boiling heat; the *second* is not affected by heat, and is at once distinguished by the characters of the deposit; the *third* may be detected by pouring a thin layer of the urine on a white plate or sheet of writing paper, and let a drop or two of nitric acid to fall upon it, when a change of colours, in which green and pink predominate, will be produced. *Hæmatoxylon*, *pareira*, *chimaphila*, and *senna*, the former especially, will impart a reddish or brownish hue to the urine; but these will be distinguished from hæmatosine by the knowledge of their having been taken, by the black precipitate produced by sulphate of iron when the first of these has produced the redness; and by the absence of albumen and hæmatosine as regards all of them.

104. The presence of blood-globules in the urine is best determined by the microscope. If the blood be recently effused, they will either be found adhering in rouleaux, or unaltered in figure. But if it have been effused for some time, or if the effusion has been slow, or the exudation of an asthenic character, the linear arrangement of the globules is lost, the investing membrane, being ruptured, is collapsed around their corpuscles or nuclei, and ultimately the globules appear irregular in their margins.

105. (*b.*) *The pathological indications* of the presence of the elements of blood, or of blood in any form, in the urine, has always been of importance, but it has become of even greater importance to the physician since the enlightened investigation by Dr. Bright of the diseases of the kidneys. When pure blood, or even the admixture of its globules in large quantity, is observed in the urine, it may be presumed that active or passive hæmorrhage from some part of the urinary passages has occurred; the more pure the blood, and the less intimately mixed with the urine, the more probable is the effusion to have taken place in the lower passages of the apparatus. If the quantity of hæmatosine be so small as only to tint the urine, it is to be presumed that both it and the albumen also present result from the congested

state of the kidneys connected with the cachectic inflammation of these organs, which terminate in the organic changes which render them incapable of eliminating the nitrogenised elements of urine and of depurating the blood, although the secreting power is so far preserved as to separate the albumen and water, this latter element being ultimately very incompletely removed. (See Art. KIDNEYS, § 83 *et seq.*)

106. When the presence of Albumen in the urine was first shown to be a proof of granular disease of the kidneys, I contended (see Art. DROPSY, § 36 *et seq.*), that this state of urine existed in several other diseases, especially in the febrile and exanthematous maladies of children, and, when congestion of the kidneys is occasioned by other affections or circumstances, although not always or continuously observed, that yet it was a contingent and occasional or temporary occurrence. Since this statement was made, from a varied observation, the truth of it has been confirmed by many subsequent observers. When blood is voided in large quantity, or when coagula are passed with the urine, breach of surface or lesion of a bloodvessel may be inferred; but the particular cause of lesion, whether congestion, rupture of a vessel, or injury, or irritation of a calculus, or malignant or fungoid disease, and the seat of either of these morbid conditions can be ascertained only from a careful examination of existing symptoms, in connection with the changes in the urine just mentioned (§§ 105, 106.), and with the circumstances attending the retention and calls to void this excretion.

107. (*c*) *Therapeutical Intentions.* These are varied, or even opposite, according to the conclusions at which the physician will arrive, after due examination and consideration of the peculiarities of each case, respecting the seat, cause, and vital conditions of Hæmaturia, as fully set forth under this head in the Article HÆMORRHAGE. (See *Hæmorrhage from the Urinary Organs*, §§ 204—220.)

108. *B.* PURULENT MATTER IN THE URINE.— Pus is seen in the urine consequent upon suppuration in the kidneys, or in any part or the urinary organs, or in parts communicating with the urinary apparatus. It is also contended that, in cases of abscess of internal viscera, the purulent collection is sometimes absorbed and discharged with the urine. But it is more probable that pus-globules, when absorbed, are metamorphosed either during their passage into, or during their circulation in, the blood, and that they cannot be eliminated by secreting organs, unless thus metamorphosed or reduced to simpler elements.

109. *a.* *The appearances of purulent urine* vary with the seat of the disease. This urine is generally acid or neutral. The pus falls to the bottom of the vessel by repose, and forms a dense homogeneous deposit, of a pale greenish or cream-colour. It never hangs in a stringy form in the urine like mucus—unless the urine be alkaline,— and it becomes uniformly diffused in the urine by agitation. If the deposited pus be agitated with an equal quantity of liquor potassæ, a dense translucent gelatinous mass, of a thick mucous appearance, is formed. When the pus is agitated with ether, fat is dissolved and left in the form of butter-like globules, when the ether is allowed to evaporate. The urine decanted from the purulent deposit yields albumen on the application of heat or nitric acid. When purulent urine is alkaline, the deposit is viscid, and is not readily diffused by agitation through the fluid, resembling some mucous deposits. The presence of albumen in the purulent urine, "and the conversion of the deposit into a white granular mass, destitute of its previous viscidity by the addition of acetic acid," indicate the nature of the deposit. In females, the urine may contain a purulent matter derived from the vagina, in cases of leucorrhœa— a circumstance requiring consideration.

110. *b.* *Microscopic characters.*— Pus consists of round globules somewhat larger than blood-globules, floating in an albuminous fluid, or *liquor puris*, which differ from the *liquor sanguinis*, chiefly in the absence of fibrin, and consequently in the inability of coagulating spontaneously. Under the microscope, the globules appear "white, roughly granular exteriorly, and are much more opaque than blood-globules. On the addition of a drop of acetic acid, the interior of the globule becomes visible, and is found to be filled with several transparent bodies or nuclei." Hence the pus-globule is a regularly organised body, consisting of a granular membrane enveloping transparent nuclei, being, in other words, a nucleated cell. (*See* DISEASE, §§ 131, 132, *and the Microscopic Characters more fully in the Art.* PUS, and in URINARY BLADDER, § 48.)

111. *C.* MUCUS is present in healthy urine in very small quantity. When irritation exists in any part of the urinary apparatus the mucus is greatly increased, and generally in proportion to the amount and extent of it; this secretion varying from a flocculent cloud in the urine to the production of a fluid so viscid as to form a copious ropy deposit. This condition of the urine is generally alkaline, and undergoes a putrefactive change soon after it is passed, or even before being voided if it be long retained. Although it be acid when passed, it rapidly becomes ammoniacal. Mucus contains no albumen admitting of coagulation by heat or nitric acid (§ 100.), and hence mucous urine simply "can never be albuminous like pus, unless the albumen be derived from some other source. Agitated with ether, mucus gives merely traces of fat, and in this respect also differs from pus." (For the *pathological* and *therapeutical* relations of Mucous Urine, see the Art. URINARY BLADDER (§ 47 *et pluries.*)

112. *D.* EPITHELIUM.— Exfoliation of the epithelial covering of the genito-urinary mucous surface is constantly taking place, but with very different rates of rapidity. This covering is sometimes partially detached, so as to appear like patches of membrane-like mucus; some of the epithelial cells being irregularly lacerated, others entire, and readily recognised by the aid of the microscope. When distended by fluid they are oval cells which become irregularly angular and flattened when partially empty. When quite empty they present in each a central nucleus projecting above the surrounding surface. These cells are said sometimes to contain fat globules, especially in the Morbus Brightii. When the exfoliation of epithelium is copious, a deposit is thereby formed in the urine, resembling mucus, but differing from it in the absence of viscidity. With liquor potassæ this deposit gelatinises nearly as perfectly as when pus is present. W

abundance of epithelium is found in the urine, oxalate of lime often also is present; the irritation of the mucous surface of the urinary passages, especially in the kidneys, very probably at the same time that it detaches the epithelium, converts the uric acid and urates into the oxalate.

113. *E.* SPERMATOZOA, or what has been called spermatic animalcules, are sometimes found in urinary deposits, when the urine of the male adult has been allowed to repose for a time.—*a.* The only means of distinctly determining the presence of semen in the urine is by ascertaining the existence of spermatozoa by the aid of the microscope. "These minute bodies never occur living in urine, unless protected by the presence of a deposit of pus, in which they retain their power of moving a long time after emission." In the microscope "the spermatozoa will be observed as minute ovate bodies, provided with a delicate bristle-like tail, which becomes more distinct on allowing a drop of urine to dry on the glass. Mixed with these are generally found round granular bodies, rather larger than the body of a spermatozoon, and nearly opaque from the numerous asperities on the surface of the investing membrane. These appear to be identical with the seminal granules described by WAGNER and others." (*Op. cit.*, p. 359.)

114. *b.* The presence of spermatozoa in the urine furnishes certain *Pathological Indications* of much importance. They may be present owing to the discharge of urine immediately or soon after seminal emission, the urine washing away the portion of semen which may remain in the urethra; or owing to a costive motion having pressed upon the spermatic receptacles, so as to press out a portion of their contents. However the presence of these bodies in the urine may be accounted for, the fact that they are commonly observed in persons who have weakened their sexual organs, either by excessive female intercourse, or by the unnatural vice of masturbation, is indisputable; and in such persons chiefly or only spermatozoa, and the much discussed affection of spermatorrhœa, is observed. The pathological and therapeutical indications furnished by this condition of the urine are considered under the head of IMPOTENCE, and more fully under that of POLLUTION, *voluntary and involuntary.*

115. *F.* FATTY OR OILY MATTER has not infrequently been found in the urine, generally, however, in minute traces only, and very rarely in any considerable quantity. It is most probable that some of the instances, in which oil has been said to have existed in the urine, have been those in which the oil-like pellicles of the earthy phosphates have formed on the surface of the urine. The genuine states of fatty urine have generally resembled milk in colour and opacity, and have gelatinised on cooling. The term chylous urine has been applied to these states by Dr. PROUT. Dr. EICHHOLZ and Dr. G. JOHNSON contended that oil or fat existed in the urine in granular disease of the kidneys, owing to the superabundance of fat in the epithelial cells of the tubular structure of the kidneys, and to the escape of these cells from the tubuli and admixture with the urine. But the quantity of fatty matter thus mingled with the urine is rarely such as to give rise to appearances indicative of its existence, unless the deposit be examined under the microscope, when the cells containing oil, sometimes presenting casts of the tubes, from which they have been detached, may be observed.

116. In most cases of chylous urine, albumen is present in very varying quantity, and forms with the fat an intimate admixture or emulsion. The fat may be obtained by agitating the urine with an equal quantity of ether in a tube. The presence of fat in albuminous urine may be viewed as a strong indication of organic disease of the kidneys; but the combination rarely exists in such a manner as to give rise to the chylous appearance of the urine. It should not be overlooked, that instances sometimes occur, in which hysterical females, to create interest in their cases, or to obtain other ends, have imparted a morbid appearance to their urine, by adding to it milk, or small quantities of blood, or other matters, by which the medical attendant has been deceived. Such instances have come before me and other physicians with whom I am acquainted. I have rarely seen cases of chylous urine. The most remarkable instance of it which I have observed was in a mulatto young man from the West Indies. Dr. G. BIRD states that, in the chylous urine he has examined, he has failed in detecting under the microscope the slightest appearance of oil-globules, blood-discs, or pus-granules; the opacity appearing to depend upon the presence of particles so minute as to present no defined form. M. L'HERITIER has, however, remarked that oily globules can always be detected in fatty urine; and Dr. SIMON, of Berlin, has made the same remark, and has stated that he has met with three varieties of fatty urine; one in which the fat is merely diffused through it, and collects on its surface by repose, as in cases recorded by Dr. ELLIOTSON; the other in which the fat is combined with albumen; and a third, in which the fatty matter existed with casein as an emulsion forming the true milky or chylous urine. Dr. BENCE JONES has investigated this state of the urine, and has arrived at the following conclusions respecting it:—

1st. The fat on which the milky aspect of the urine depends appears after the absorption of chyle, but the albumen, fibrin, blood, and alkaline salts, may be found even when no food has been taken, and consequently no chyle formed. 2nd. During absolute rest, albumen disappears from the urine, and does not reappear in any quantity, even after taking food, unless active exercise is employed. A short time before rising early, the urine gelatinises by repose, but is free from fat. 3rd. This state of urine does not depend upon the presence of an excess of fat in the blood as proved by actual analysis. 4th. The seat of this disease is probably some slight alteration in the structure of the kidneys, by which, when the circulation through these organs is most active, one or more of the constituents of the blood exude from the capillaries and escape into the urine.

Dr. G. R. BOUYUN, of Demerara (Dr. G. BIRD states), has observed cases of chylous urine so frequent in creoles and negroes as to be often epidemic in that country. This state of the urine appears to be attended by irritative fever and emaciation as in diabetes. He attributes the disease to lesion of the assimilative functions; and he treats it by the free administration of a decoction of the mangrove bark (*Rhizophera racemosa*)

This medicine acts freely on the skin, increases the secretion and alters the character of the urine, and improves the general health.

117. *G.* Confervoid Growths.—*Torula Cerevisiæ—Fungoid Growths—Vibriones, &c.*, have been described as existing in the urine, in certain states of the frame, chiefly characterised by remarkable depression of vital power. The existence of these may be imputed to the presence of albuminous, fibrinous, saccharine, or other matters in the urine, and to changes which have taken place in these after the urine has been discharged, although they may possibly be formed in the bladder, when the urine is long retained in these morbid states in this viscus, especially when the vital energies are very much depressed, and the other circumstances favourable to these productions already adverted to (§ 82.) are present.

118. *H.* Hydatids have been passed in the urine; but cases in which they thus have been observed are extremely rare. Instances have, however, been recorded in the Philosophical Transactions (No. 273) and in the Medical Observations and Inquiries by Mr. Russel (vol. iii.). A case came before me many years ago, in which a number, varying in size from a small pea, to that of a large bean, were passed, in the course of two or three days. Soon afterwards the case passed from under my observation, without being able to ascertain its issue.

119. xii. Foreign Bodies.—*Worms, &c.*, have been often found in the urine, in some cases in consequence of having been introduced into the bladder, in others from having been put into the urine with the intention of deception; and, in more instances owing to their passage by ulceration, penetration, or otherwise, through the parietes of some portion of the digestive canal, or abdominal parietes. Whoever may be desirous of perusing cases of this description will find a number of them related in the Ephemerides of Natural Curiosities, and in the Memoirs of the French Academies, and various other works enumerated by Ploucquet and Reuss.

120. IV. Gravel.—*Urinary deposits*, such as are above described, are formed on the cooling of urine, and are, as described, either loose and pulverulent, or more concrete, crystalline, or sand-like. These deposits, although associated with, or symptomatic of, various diseases, may occasion, as respects their effects upon the urinary organs, but little disorder. But when deposits are formed in the warm urine within the urinary apparatus, owing either to the quantity of these matters contained in the urine, or to changes in the states of their constituents, or of temperature, vital endowment, &c., and are discharged with the urine in the form of a fine powder, or of crystalline sand-like particles, or of small masses, then the disease is termed *Gravel*, and the symptoms are sometimes very severe.

121. The discharge of such gritty matters as these with the urine is usually attended by symptoms of irritation, and pain in the regions of the kidneys, ureters, bladder, and in the urethra, thereby constituting whilst characterising the complaint commonly denominated gravel. The signs of irritation may be slight, or they may be severe in one or other of the situations just named, or even in two or more of them. But the signs, as well as the causes which produce this condition of the urine, are the same as those which attend the formation of calculi in the urinary apparatus, although they are very frequently much less severe. The chemical constitution of the gravel discharged is generally the same as that of urinary calculi; the difference consisting chiefly in the constituents precipitated from the urine being detached or incoherent, or forming numerous minute crystals, instead of large concretions, of many concentric layers. In the former case, the deposits within the urinary organs are washed away by the urine before they have been sufficiently long retained to concrete into a nucleus, or to become a large calculus — or to assume the characters now to be described.—Calculi. The *Treatment of Gravel* is manifestly the same as that recommended for urinary deposits and *Urinary Calculi.* (See § 179 *et seq.*)

122. V. Urinary Concretions or Calculi.—Correct views as to the composition and formation of urinary concretions or calculi are of comparatively recent date. Previously to Van Helmont these concretions were believed to be derived from matters contained in the food and drink; but he contended that they are not formed from these sources. Hales confirmed the opinions of Van Helmont as to the differences between urinary concretions and common stones, and first directed attention to the discovery of a solvent for these concretions. Boyle, Whytt, Alston, Slare, and others, subsequently speculated on the subject of solvents for calculi. Whytt proposed lime-water for this purpose; and Alston contended that, although lime-water is of some service in urinary affections, it is not a solvent of calculi. At the commencement of the last century the Leyden School of Medicine taught more correct doctrines of the formation of urinary concretions than had previously been entertained; and showed that these nuclei were derived from the kidneys or from the bladder. Van Swieten contended that the elements of calculi exist in the urine of men the most healthy, and that if the urine be evacuated before these elements concur in the formation of a concretion, no such production takes place. He considered that the concurrence of the elements in the formation of calculi is exerted more or less slowly in different persons; and that according to the rapidity or slowness of such formation, the concretions are formed either in the kidneys or in the bladder. In 1776 Scheele discovered uric acid, and found it in all the calculi he examined, as well as in all the urine. Bergmann soon afterwards discovered lime in certain concretions. In 1797 Wollaston published his discovery of three calculi in addition to those described by Scheele — viz., the fusible, mulberry, and the bone-earth — and demonstrated the chemical composition of these calculi. A few years afterwards Fourcroy and Vauquelin announced the presence of urate of ammonia and silica in urinary concretions. Dr. Wollaston, in 1810, discovered cystic oxide as an urinary calculus. Dr. Marcet published an able work on urinary concretions in 1817; and Dr. Prout furnished, in 1821, more extended and exact views as to their formation in his treatise on this subject. Since this period the works of Mr. Wilson, of Sir B. C. Brodie, of Mr. Crosse of Norwich, of Dr. T. Thomson, of Dr. Cumin, of Dr. Owen Rees, of Dr. Bence Jones, of Mr. Coulson, and the

more recent publications of Dr. Prout, have carried the pathology and treatment of urinary concretions to their present very high position in practical medicine and surgery.

123. *A.* The *form* of urinary concretions is generally more or less globular or ovoid, especially after remaining long in the bladder. Renal calculi are, however, often of an irregular form, owing to their being moulded in the pelvis of the kidney, &c., or are branched like a coralline. Sometimes those found in the ureter are cylindrical. When two or more calculi exist in the bladder they often present a polyhedral or an irregular shape, from one or more of their sides being flattened, either by attrition or by diminished concentric deposition on these sides. When the calculi formed in the kidneys and passed into the bladder are irregular or branched, the shape of the nuclei which they constitute is not altogether removed by the successive deposits formed around them in the bladder. When a portion of a calculus is embraced by a fold of the mucous membrane, or sacculated between the muscular fasciculi or coats of the bladder, the part exposed to the urine increases by successive deposits, so that the sacculated portion ultimately appears to form a pedicle to the entire calculus. (Coulson.)

124. *B.* The *size* and *weight* of urinary concretions are most various — ranging from a few grains to many ounces. Earle mentions one weighing forty-four ounces; Lister, one of fifty-one ounces; and Morand, one weighing six pounds three ounces! The concretion described by Earle measured sixteen inches in circumference. The *number* of calculi co-existing in the bladder or in the kidneys is often very various. Most frequently vesical calculi are solitary; but two or even more are not uncommon. They are often numerous in one or both kidneys; but generally not equally so in both. From ten to twenty or even thirty in both are not uncommon. An equally great number are very rarely found in the bladder; although it is stated that fifty-nine small calculi were found in the bladder of Buffon.

125. *C.* The *surface* of calculi also varies in its colour and characters. The *colour* passes from "white through pale yellow to brown, brownish-green, and even almost to black. Phosphatic calculi are often white; those of uric acid vary from yellow to brown; those of xanthic oxide have a cinnamon brown tint; while calculi of oxalate of lime vary from yellow to yellowish-brown, brownish-green, or even blackish-green." The surface is either smooth, and even polished, or covered with minute crystals, or more or less rough, and even tuberculated, as in the mulberry calculus.

126. *D.* The *internal structure* or section of a calculus is either uniform, or formed of concentric layers surrounding the nucleus; and, in addition to the concentric lines indicating the separation of the layers, other lines, radiating from the nucleus to the periphery, are observed in many of the concretions. In some the concentric layers are easily separable, in others very firmly adherent, especially when the layers are indicated only by very faint lines, as in the oxalate of lime calculus.

127. *E.* The *chemical composition* of the nucleus, and of the concentric layers or deposits, may be the same; or that of the superimposed strata may differ from the nucleus, or each of the strata may be different. The *constituents* are *first* those which form entire calculi or layers, in a nearly pure state, and *secondly* those which contain, associated with these constituents, small quantities of other substances.

128. *First Class.* — 1. Uric acid. — 2. Uric or xanthic oxide. — 3. Urate of ammonia. — 4. Cystic oxide, or cystine. — 5. Ammoniaco-magnesian phosphate. — 6. Oxalate of lime. — 7. Phosphate of lime. — 8. Carbonate of lime. — 9. Mixed phosphate of lime, and phosphate of magnesia and ammonia.

129. *Second Class.* — Those concretions which, with the foregoing, contain the following in small quantities. — 1. Urate of potass. — 2. Urate of soda. — 3. Urate of lime. — 4. Urate of magnesia. — 5. Carbonate of magnesia. — 6. Silica. — 7. Organic matter, fat, extractive, albumen, vesical mucus, blood. In addition to these, oxide of iron, benzoate of ammonia, phosphate of iron, urea, oxalate of ammonia, hydrochlorate of ammonia, in very minute quantities, are said to have been formed.

130. The following Table, drawn up by Dr. Bence Jones, shows the readiest means of ascertaining the composition of urinary calculi:—

1. *By Heat.*	2. *By Acids.*	3. *By Alkalies.*	*Nature of Calculus.*	*Additional Tests.*
Destroyed by heat.	With nitric acid, red.	Soluble in carbonate of potash, evolving ammonia.	*Urate of ammonia.*	Soluble in water when boiled.
		Soluble in carbonate of potash, evolving no ammonia.	*Uric acid.*	Not soluble in water when boiled.
	With nitric acid, not red.	In ammonia, soluble, crystallising when evaporated.	*Cystic oxide.*	Soluble in strong caustic potash: the solution gives sulphuret of lead, when boiled with a solution of acetate of lead.
		In ammonia, soluble, not crystallising when evaporated.	*Uric or xanthic acid.*	Dissolves without effervescence, in nitric acid, leaving a lemon-coloured residue, soluble in strong sulphuric acid, not precipitated by dilution.
		In ammonia with difficulty soluble, not crystallising.	*Fibrine.*	With nitric acid becomes yellow.

By Heat.	2. *By Acids.*	3. *By Alkalies.*	*Nature of Calculus.*	*Additional Tests.*
Not destroyed by heat.	With hydrochloric acid, soluble; before heat effervesces.	Solution in acid, when neutralised, gives a white precipitate with carbonated alkalies and oxalate of ammonia.	*Carbonate of lime.*	Soluble in dilute acetic acid, with effervescence.
	With hydrochloric acid, soluble; after heat effervesces.	Solution in acid, when neutralised, gives a white precipitate with carbonated alkalies and oxalate of ammonia.	*Oxalate of lime.*	Insoluble in acetic acid. Decomposed by strong sulphuric acid, yielding carbonic acid and carbonic oxide.
	With hydrochloric acid, soluble, without effervescence; or before or after heat.	Solution in acid, with excess of ammonia, gives a white crystalline precipitate.	*Phosphate of ammonia and magnesia.*	With phosphate of lime is very fusible before the blow-pipe.
		Solution in acid, with excess of ammonia, gives an amorphous white precipitate.	*Phosphate of lime.*	With phosphate of magnesia and ammonia is very fusible before the blow-pipe.
		Solution in acid, with excess of ammonia, gives a white, partly crystalline, partly amorphous, precipitate.	*Mixed phosphates.*	Easily fusible, without addition, before the blow-pipe.

131. i. *Uric acid calculus.*—Uric acid is the most frequent constituent of urinary concretions, either alone or in combination with bases, especially urate of ammonia, &c. Calculi consisting of uric acid only, or containing in addition a small quantity of colouring matter, are more common than those of any other single constituent. Mr. COULSON states the relative number of pure uric acid calculi in the Museum of the College of Surgeons to be one-third of the whole collection. Dr. PROUT estimated the general average of this concretion in the several known collections to be nearly 1 : 6¼. The relative proportions of those composed chiefly of uric acid mixed with urate of ammonia, and of urate of ammonia with minute proportions of urate and oxalate of lime and phosphates, are estimated at 1 : 3½; and including the calculi in which the nuclei are formed of uric acid, the proportion is about 1 : 1½. The calculi into which uric acid enters in larger or smaller proportions, as one of the constituents, in the Collection of the London College of Surgeons, are as 1 to 1·36 of the whole number. Two chief varieties of this calculus consist—1st, of that in which the uric acid is deposited in more or less distinct concentric layers, the section of the calculus presenting a series of concentric circles of a compact and semi-crystalline structure;—2nd, of that in which the acid forms a mass of crystalline amorphous grains. These varieties, however, often are mixed, or pass into each other. The first of these have a sometimes granular or finely tuberculated, but smooth or polished surface. When broken, the fragments are angular, whose surfaces are fibrous, as if the concretion were composed of crystalline fibres radiating from the centre to the circumference. The fracture is always in the direction of these radiating fibres and of the concentric layers. The second variety, in which no concentric lamellæ are seen, consists either of a firm aggregation of crystalline grains presenting a radiated appearance, or of a porous and earthy structure, often more or less loosely cohering. These calculi are less regular than the former, "have a rough surface, a granular and unsymmetrical fracture, and are most frequent in the kidneys. The nucleus of the laminated variety frequently presents this character. This form of calculus is more liable than the compact laminated variety to spontaneous fracture in the bladder." Calculi sometimes present cracks in the direction of the radiating fibres, probably owing to an unequal density in the deposits.

132. A third variety of uric acid calculus is known as the pisiform, and is very common. It is seldom solitary; many may exist at the same time in the bladder, and some may be voided by the urethra. They are chiefly formed in the kidneys, and are rarely larger than a common bean or large pea. They have irregular angular shapes caused by attrition against each other, are crystalline, laminated near the surface, and often coated with a thin layer of urate of ammonia.

133. The specific gravity of uric acid calculus varies with the density, and is usually from 1·5 to 1·786; but it has been observed in rare instances as low as 1·276. The colour of this calculus varies from pure white to a deep brownish-red; the colouring matter being of the same nature as that of the urine. (§ 18.) Uric acid is insoluble in alcohol and ether; but is soluble in solutions of potash and soda when heated, and in phosphate and biborate of soda, and is precipitated from these by acids. Solutions of the alkaline bicarbonates do not dissolve it. Nitric acid dissolves and decomposes it, equal volumes of carbonic acid and nitrogen being evolved. "Sulphuric and hydrochloric acids do not affect it. Uric acid is a feeble acid, but combines with bases, and forms salts with them. The alkaline urates are sparingly soluble, but very much more so than the pure acid."

134. ii. *Urate of ammonia calculus*, unmixed, is rare. In the collection of the College of Surgeons it exists in the proportion only of one in 500, although this substance forms the nucleus of nearly one-third of the whole collection. (COULSON.) Dr. PROUT, in 1823, first fully demonstrated the nature of this concretion, which seldom exceeds an inch in diameter, and is almost peculiar to childhood. It very rarely occurs in an unmixed state after puberty, and its formation is attended by much constitutional irritation. It is flattened, ovoid, smooth, of a brownish-gray or clay colour, often with a greenish tinge. It is usually compact in structure, earthy and brittle, consisting of thin concentric layers, so closely applied to each other as to appear homogeneous. The laminæ are, however, easily separated. Urate

of ammonia is a common deposit from urine, having an alkaline reaction, carrying with it more or less colouring matter, which gives it a yellow or brown hue. In its pure state it is white, and much more soluble in water than uric acid.

135. This salt is often associated with oxalate of lime in calculi, the formation of this latter being preceded by a condition of the urine which favours the deposit of urate of ammonia, so that the nucleus may be formed of urate of ammonia, while the surrounding layers are a mixture of these salts. These calculi sometimes also contain a small quantity of urate of lime. Urate of ammonia is also frequently associated with the earthy phosphates, either as a nucleus or in alternate layers, or mixed in various proportions with the other constituents.

136. iii. *Xanthic or uric oxide calculus* is so very rare as hardly to deserve notice; only four specimens of it having been found. It may be distinguished by the means stated in the table given above (§ 130.).

137. iv. *Cystic oxide calculus* is also rare. It is a product of the kidneys only, and hence should be differently named. Dr. Prout found it only in four out of seven museums. That of the College of Surgeons contains one or two specimens. It is small, round, and yellowish, with a smooth semi-transparent and glistening surface. This substance is generally free from admixture with others; " but uric acid sometimes forms the nucleus, and a layer of uric acid has been found surrounding a nucleus of cystic oxide. It is also occasionally associated with ammoniaco-magnesian phosphate, and carbonate of magnesia."

138. v. *Oxalate of lime calculus*, in an unmixed state, exists in the Museum of the College of Surgeons in the proportion of 1 : 20; in that of St. Bartholomew, as 1 : 15; and in that of Guy's Hospital, as 1 : 14½. When oxalate of lime calculi having nuclei of urate of ammonia are included, the proportion in the Museum of the College of Surgeons is 1 in 3½. If all the calculi be taken in which the oxalate of lime exists in any amount, then the proportion is, according to Dr. Prout, in St. Bartholomew's Hospital, 1 : 4½; in Guy's, 1 : 4; in Norwich, 1 : 7½; in Manchester, 1 : 6⅙; in Bristol, 1 : 3⅓; in Swabia, 1 : 27; and in Copenhagen, 1 : 2⅒; the average proportion being 1 : 4⅓. Oxalate of lime calculus is rarely pure, being associated with urate of ammonia, uric acid, urate and carbonate of lime, colouring matter, and blood. This calculus, long known by the name of Mulberry Calculus from its tuberculated surface and its resemblance to that fruit, has usually a rounded shape, its surface being dark brown, or nearly black. Its internal structure is compact and hard, imperfectly lamellated, the layers forming waving lines, the colour of which is such as to give the surface of its section a resemblance to a section of a piece of gnarled oak, varying from white or yellow to yellowish-brown, or dark brownish-green. The tubercles of the surface appear to consist of stellate crystals. A second variety of the oxalate of lime calculus is crystalline throughout, its surface being studded with crystals of the oxalate in acutely angled octahedra, these being nearly pure oxalate of lime. A third variety consists of small rounded masses, with a smooth, polished surface, known as the hemp-seed calculi. It is occasionally crystalline at the centre and laminated towards the surface, but the laminæ are so fine as to give the section almost a compact appearance. It is composed of mixed oxalate and phosphate of lime in variable proportions.

139. vi. *Phosphate of lime calculus* is rare, especially in a state of purity. Two varieties have been described,— "one evidently of renal, the other of vesical origin. Although entire calculi of pure phosphate of lime are uncommon, this substance is often found nearly pure in the laminæ of alternating calculi." Dr. Prout states that calculi of phosphate of lime are in the ratio of 1 : 32¼ in St. Bartholomew's Hospital; of 1 : 29 in Guy's; of 1 : 132 in Norwich; and of 1 : 155 in the Bristol hospital. The general proportion of these calculi to others is 1 : 117. No specimen exists in the Museum of the College of Surgeons, and in some other collections. The calculi considered renal are composed of the neutral phosphate of lime; those considered vesical are more common than the former. Concretions of neutral phosphate of lime are usually pale-brown, with a polished surface, regularly laminated, and the laminæ so slightly adherent as to be easily separable into concentric crusts. In some, radiating lines are seen perpendicular to the laminæ. Those calculi contain animal matter which is precipitated from the alkaline urine with the phosphate of lime.

140. vii. *Ammoniaco-magnesian phosphate calculus* is commonly known as the "triple phosphate." This double salt rarely forms an entire calculus, but is a very common constituent of other calculi, either mixed with phosphate of lime, as in the fusible calculus, or forming layers in alternating calculi. The proportion of calculi consisting of pure phosphate of magnesia and ammonia, in the collection of St. Bartholomew is as 1 : 129; in Guy's, as 1 : 43⅓; in the Bristol hospital, 1 : 218; in Copenhagen, 1 : 19½; in the Museum of the College of Surgeons, 1 : 200; while the other collections mentioned by Dr. Prout contain no specimen. The general ratio is 1 : 126⅔. Ammoniaco-magnesian phosphate is a frequent deposit from alkalescent urine, but usually mixed with more or less phosphate of lime. Calculi of this double salt " are generally white, uneven, and roughened by the projecting summits of the crystals, which are transparent in the recent state, but opaque and without lustre after being kept for some time. These calculi are either not laminated or imperfectly so, are friable and easily reduced to powder. But occasionally they are hard, compact, and laminated; exhibiting a semi-transparent crystalline fracture, which gives them the aspect of alabaster" (Coulson, *Op. cit.* p. 291.).

141. viii. *Fusible Calculus.*—Calculi known by this name consist of a mixture of phosphate of magnesia and ammonia, with phosphate of lime in very variable proportions; and they form a considerable portion of all collections. In the College of Surgeons they are as 1 : 13⅓; in St. Bartholomew's, as 1 : 12⅒; in Guy's, 1 : 3⅓; in Norwich, as 1 : 19; in Manchester, 1 : 8⅓; in Bristol, 1 : 12; in Swabia, 1 : 11⅓; and in Copenhagen, as 1 : 19½, according to Prout: the average proportion being 1 : 12¼. Fusible calculi are white, grey, or dull yellow; and more friable

than any others, "being sometimes so soft as to whiten the fingers like chalk when handled: these are not laminated. Others have distinct lamellæ, with sparkling crystals of triple phosphate between them, which are so slightly adherent as to be readily separated; others, again, are composed of crystals aggregated into a confused mass." These calculi are usually globular or ovoid, but sometimes very irregular in shape, being occasionally moulded by the cavity in which they are formed. "They often attain a large size, and sometimes fill the whole cavity of the bladder; in this case impressions of the folds of the mucous membrane are visible on the surface, and when two or more in the bladder, they take a cubic or tetrahedral form." Excrescences composed of triple phosphate are sometimes found, resembling pearls. The ammoniaco-magnesian phosphate is most abundant in those which have a shining crystalline texture, the phosphate of lime in the earthy and amorphous variety. The fusible calculus is found in all parts of the urinary organs, and in large cysts, or in cavities in the prostate gland. According to Mr. Taylor the earthy phosphates are rarely succeeded by any other deposit; the only exceptions being one in the College of Surgeons, in which layers of mixed phosphates exist in an oxalate of lime calculus, and one in St. Bartholomew's Hospital, in which a fusible calculus is surrounded by a layer of uric acid. The two ingredients of fusible calculi seem to have a distinct origin; the ammoniaco-magnesian phosphate being derived from the urine, while the phosphate, with a small proportion of carbonate of lime, is secreted together with mucus by the irritated mucous membrane. This is shown in calculi formed around a foreign body introduced into the bladder. This body is first incrusted with phosphate and carbonate of lime, derived, it is believed, chiefly from the mucous surface of the bladder; and subsequently, the irritation being extended to the kidneys, the urine becomes alkaline, and ammoniaco-magnesian phosphate is deposited; the layers near the nucleus containing more phosphate of lime than those near the surface of the calculus. As a secondary deposit the mixed phosphates are very common, few calculi remaining for a long period in the bladder without being incrusted by them. The uric acid calculus is least subject to this incrustation. These calculi commonly contain urate of ammonia and animal matter in considerable proportion, together with carbonate and urate of lime and uric acid.

142. ix. *Carbonate of lime calculus*, associated only with a little animal matter, is very rare in the human subject, but common in herbivorous animals, usually mixed in these with carbonate of magnesia. Carbonate of lime is, however, often found in variable proportion in the oxalate of lime and phosphatic calculi. Brugnatelli, Prout, and Smith have described the carbonate of lime calculi. They are always small, the largest not exceeding the size of a large almond; are white or grey, but sometimes yellow, brown, or reddish, and the surface is dusted over with a white powder. They show no concentric laminæ, but irregular waved lines similar to those in the mulberry calculus. They are sometimes remarkably hard, and capable of receiving a high polish. Others passed by the urethra of a rounded and flattened form are compact, lamellar, and light brown. "No specimens of this calculus exist in the museums enumerated by Dr. Prout, nor in that of the College of Surgeons." "Mr. Smith describes eighteen removed from the bladder of a young man; and Brugnatelli forty-eight from a similar source, and sixteen, the size of a nut, from a woman."

143. x. *Alternating calculi* form a very large proportion of those formed in the human urinary apparatus. This alternation of the constituents in the layers of the same calculus is manifestly owing to successive changes in the urinary secretion, depending upon varying states of the constitution and vital and assimilative power. Alternating calculi consist of a series of alternating layers, differing in chemical composition. Some are composed of two layers, a nucleus of uric acid being covered by a deposit of urate of ammonia, or of oxalate of lime, or phosphate of lime, or mixed phosphates. The nucleus may be oxalate of lime, followed by uric acid, or urate of ammonia, phosphate of lime, or mixed phosphates. "Other calculi have three differently constituted layers; thus, a nucleus of uric acid may have deposits of oxalate of lime and mixed phosphates, or oxalate of lime and uric acid; or a nucleus of oxalate of lime, covered by uric acid and urate of ammonia; or a nucleus of mixed phosphates followed by phosphate of lime and mixed phosphates. Others, again, consist of four or even more layers: thus, a nucleus of uric acid incrusted by urate of ammonia, uric acid, and urate of ammonia; or oxalate of lime, followed by uric acid, oxalate of lime, phosphate of lime, &c." (*Op. Cit.* 296.)

144. The proportion of *alternating calculi*, of two layers differing in chemical constitution, appears from several sources to average 1 : $2\frac{1}{3}$. The proportion of calculi consisting of three alternations are 1 : $8\frac{1}{3}$; and of those of four alternations in the Norwich collection are 1 : $26\frac{1}{3}$. The order in which different deposits succeed each other in calculi has been examined by Dr. Prout, with the view of elucidating the changes in the economy upon which this order depends. He found, that the frequency of alternation of uric acid and oxalate of lime is nearly equal; that oxalate of lime follows urate of ammonia more frequently than uric acid; that the general ratio in which phosphates succeed other deposits in all the collections is 1 : $4\frac{1}{13}$; and that a decided deposition of the mixed phosphates in calculi is not followed by other deposits.

145. xi. *Fibrinous calculus* was first described by Dr. Marcet. It is stated by Dr. Prout to be usually of an amber colour and waxy consistence, with more or less of a fibrous texture. As to the chemical tests for this and the other calculi described above I must refer the reader to the *table* given above from Dr. Bence Jones (§ 130.); and to the chapter on "The Chemistry of Urinary Concretions," in Mr. Coulson's able work already referred to.

146. VI. Causes of Urinary Calculi. — The causes of urinary concretions may be inferred from what I have stated above with reference to the pathological conditions occasioning the several forms of urinary deposit, the concretions taking place in different parts of the urinary apparatus being merely early deposits in those situations of the same constituents as are precipitated b

urine after being discharged from the body. Whether the concretions are formed within the body, or the deposits take place after the urine is evacuated from the body, many, indeed most of their causes, are the same; the states of the urine which produce them arising chiefly from (*a*), age and habits of life; (*b*), from climate, locality, and race; (*c*), from diet and regimen; (*d*), from morbid digestion and assimilation; (*e*), from pathological states of the kidneys, and from the metamorphosis of tissues and of blood globules, in connection (*f*), with constitutional and vital conditions. But it may be asked, Wherefore should concretions form within the urinary organs, consisting of the same or nearly the same constituents as are deposited from the evacuated and cold urine? To this question the chief answer must be that which I have stated above (*see* §§ 80—4.), namely, that low states of vital power favour the more rapid evolution of that portion of vital emanation which all secretions (the urine as well) possess for a shorter or longer period after secretion according to the amount of vitality endowing the secreting organs, in connection with the extent of change in the constitution of the secretions, with their accumulation and retention, and with the amount of vital influence and animal heat retained by them, or furnished to them, during their retention. Although these causes of urinary deposit and concretion have been above considered with reference to the deposits found after the urine is evacuated, certain topics connected with them, more especially with the formation of calculi, require a more particular notice than they have yet received.

147. Deposits from the urine, more or less abundant after evacuation, may proceed for a very long time without any deposit taking place within any part of the urinary apparatus. This immunity from the formation of calculi may arise either from the circumstance of the urine having not been saturated with the substance or substances which usually pass into calculus, or from the states of vital power being unfavourable to the formation of renal or vesical concretions, or from the absence of other causes, which favour such formation.

148. i. *Age and sex.*—The liability of children to calculi has been remarked from the days of Hippocrates; and Mr. Coulson quotes the "*Methode of Physick,*" in which the author, Philip Barrough, remarks that "stones in the bladder do engender oftener in children than in older folk." (*Lib. iii. c.* 41. *editio quinta*, 1617.) Although the liability of strong and well-fed children may not be greater than that of any other class of subjects, yet there is no doubt of weakly, unhealthy, and ill-fed infants and children being more frequently affected with gravel and calculi than older persons. Of 478 operations for stone in the Norwich hospital during a period of forty-four years, 227 were in children under fourteen years. According to Dr. Prout, the following is the relative frequency of urinary calculi at different ages: — Under 10 years of age, 500; — from 10 to 20, 192;—from 20 to 30, 104;—from 30 to 40, 94;—from 40 to 60, 112;—from 60 to 70, 97; — and from 70 to 80, 12. Taking into consideration the numbers of those living at the most advanced ages, urinary concretions are more frequent at these ages than in the prime of life.*

149. Females, notwithstanding their more sedentary habits, and their liability to retain their urine for long periods, are less frequently subject to calculus than males. This is partly owing to their temperate and abstemious habits, and partly to the facility with which a small calculus may escape from the female bladder soon after its descent from the kidneys, and before its retention in the bladder has enabled it to acquire a great size by successive depositions around it. The female urethra, admitting of greater dilatation, and being less complex than the male urethra, and otherwise differently connected and circumstanced, allows the spontaneous passage of calculi which would be retained in the male bladder, and could be removed only by an operation.

150. ii. *Habits of living.* — Sedentary habits, and luxurious feeding, are more or less influential, according as they may be associated with other causes, in occasioning urinary concretions. The former impairs very remarkably the functions of the skin, and prevents that amount of blood-depuration which these functions effect; the latter furnishes the pabulum, or source, from which urinary concretions are in great part derived. When these habits exist in, or are conjoined with, a gouty diathesis, the occurrence of gravel or calculi is often observed; and much more remarkably when a meat diet and malt liquors are very liberally indulged in; for this diet, especially the more nitrogenised kinds, forms urea and the urates in great abundance, and generates either gout, or gravel, or calculi, or both, and subjects the kidneys to a much greater amount of depurating function by increasing the quantity of morbid materials which require removal from the blood.

151. When the skin ceases to discharge its share of this process of blood-depuration, an increased demand is made upon the kidneys, and an increased supply of the constituents of urinary deposit is furnished to these organs. It will thus appear very manifest that, as the same causes as are more or less concerned in the production of gravel and calculi are also productive of gout, these two diseases must be frequently associated in the same person. The association of calculi with rheumatism is much less frequent than with gout; but when it occurs it may be imputed in great measure to a similar combination of causes.

152. iii. *Climate, locality, and race* very considerably influence the occurrence of urinary concretions. It is very difficult in many instances to explain the operation of these; but there is no doubt of these maladies being more frequent in humid, temperate, and changeable climates, than in very warm or very cold countries; in some localities than in others even of the same country; and in the white than the dark races. Holland, France, England, Germany, have been regarded as furnishing the greatest number of calculous cases; but other countries are by no means ex-

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* M. Civiale, in his "*Treatise on Calculous Affections,*" states that of 5,376 cases, 2,416 were children, 2,167 adults, and 793 old persons. He says that 1,946 occurred before the age of ten, 943 from ten to twenty, 460 from twenty to thirty, 330 from thirty to forty, 391 from forty to fifty, 513 from fifty to sixty, 577 from sixty to seventy, 199 from seventy to eighty, and 17 after eighty. Instances of calculus have been recorded from birth, and very soon after birth. Mr. Coulson operated for stone on a child of eighteen months, and upon a man of eighty years of age.

empt from them. Within the tropics, urinary concretions are more rarely observed than in temperate countries, and chiefly, or only, in the very young and ill-fed. The marked infrequency of these concretions in the dark races is chiefly to be imputed to the very small proportion of animal food constituting the diet of these races, especially within the tropics, and to the greater activity of their cutaneous functions.[*]

The imputed infrequency of calculi in very cold countries is accounted for with much difficulty, especially as animal food is generally freely used. The active employments followed by the natives of those countries, a fish diet adopted by many, and other unascertained influences, may combine to produce this partial immunity. The greater prevalence of calculous diseases in Norfolk than in any other county in England is fully admitted. Mr. Crosse, the eminent surgeon of Norwich, considered this prevalence to be owing to a combination of causes — to the variableness of the climate of Norfolk, to the prevalence of north-east winds, and more especially to the frequency of dyspepsia and acidity in the stomach, and to the consequent superabundance of uric acid in the urine. Sœmmering states that calculous and gouty affections are unknown, or most rare, in some situations bordering on the Rhine. Liebig imputes this immunity to the Rhenish wines, which contain a considerable quantity of the bitartrate of potash. This salt, he contends, changes in the progress of digestion to the carbonate of potash, and acts the part of an alkali.

153. It was formerly believed that the waters of a locality had some influence in producing urinary concretions. This opinion has, however, been controverted by several modern writers; and it is undetermined whether or no the waters which abound in calcareous or other mineral substances have any effect in occasioning urinary calculi. The subject has not been investigated with precision, and the arguments on both sides are loose, and indeterminate as to facts.

154. It has been contended by Mr. Copland Hutchison and Sir G. Ballingall that sailors and soldiers are almost exempt from urinary concretions. But, when it is considered that both sailors and soldiers are of those ages in which these concretions are seldom observed, the extent of this exemption cannot be great. Whatever it may be, the activity of the digestive assimilating and depurating functions in these classes and at their periods of life evidently constitutes its chief cause.

155. iv. *Diet and regimen* has more influence on the frequency of calculous diseases than is generally believed. The evil produced by animal food used in excess — and many use it in excess relatively to the amount of exercise taken — has been already adverted to (§ 150.). Highly nitrogenised animal diet furnishes a rich and an abundant chyle, which, during its circulation in the blood through the several viscera, becomes oxidised and otherwise changed, and, in various states of metamorphosis, under the influence of vitality, originates the most important parts of those materials which require a continued elimination from the blood; and if this end be not attained by the active discharge of the several depurating functions—by the kidneys, skin, mucous surfaces, &c.; and if it be not promoted by exercise sufficient for its fulfilment, an accumulation of these materials in the blood takes place, and, becoming more and more highly animalised and morbid, and irritating by their retention and accumulation, occasions serious diseases, amongst which Gout (as shown in that article, §§ 33—42.) and urinary concretions are the most common.

156. v. *Metamorphosis and waste of tissues*, &c. —It will be seen, from what has been stated above (§§ 41—5.), that Baron Liebig and Dr. Golding Bird have attributed the solid materials dissolved in the urine, with their deposits and concretions, to the chemical combinations of the elements resulting from the metamorphosis and waste of the tissues in the course of the regeneration and nutrition of these tissues. But if we take into consideration the great amount of these materials discharged into the urine, and refer them only to the sources from which these writers derive them, it must follow that these tissues ought to be renewed several times every successive year of existence! It must be admitted that the metamorphosis and waste of the tissues — to which I would add similar changes in the red globules of the blood also — furnish some part of these materials; but a much greater share is supplied by the food, by the chyle conveyed into and circulating with the blood, and by the successive changes therein produced, under the influence of vitality; the regeneration and nutrition of the tissues requiring only a small but appropriate portion of the constituents thus supplied, the less appropriate materials being eliminated from the circulation by the kidneys, skin, and other depurating organs.

157. vi. *Indigestion, fermentation, and mal-assimilation* are causes of urinary deposit and concretion intimately connected with a too full, rich, or unwholesome diet. Numerous articles of food are indigestible in their nature, more especially if not sparingly partaken of, and are liable to become rancid in the stomach, and to occasion rancid eructations; whilst others are more disposed to fermentation, and to generate acidity in the stomach and bowels; both rancidity and acidity sometimes occurring simultaneously, according to the nature of the food, to the quantity taken, and to the powers of digestion and assimilation. Owing to undue and superabundant quantity, or to improper quality, or to both, an imperfectly digested and assimilated chyle is formed and carried into the circulation, furnishing the material elements of disease, and more especially of urinary concretions. But it is not only to full diet, much animal food, or to unwholesome aliment, that these concretions may be remotely imputed; but also to insufficient food, especially in early life. In this latter case, the powers

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[*] Dr. Gross (*On the Diseases and Injuries of the Urinary Bladder*, *&c.*, 8vo. Philadelphia, 1851) confirms the rare occurrence of urinary calculi in the coloured races. In ten years he never met with an instance of gravel or of stone in a coloured person. Dr. Dudley in Kentucky, who has the largest practice there, never operated for stone on more than two or three persons, who are constantly exposed to hard labour, and fare often upon the coarsest food. Dr. Gross states that urinary calculi are rare in Canada, in Texas, Mexico, and California, that in the United States a larger number of children are subject to calculi in Kentucky, Ohio, Tennessee, and Alabama than in any other part; and that the inhabitants of Missouri, Iowa, Wisconsin, Michigan, Indiana, New York, and New Jersey are comparatively exempt.

life are so reduced by the insufficient nourishment as to imperfectly digest and assimilate what is taken, and the blood is thereby diminished in quantity and impaired in quality.

158. vii. *Constitutional and vital conditions* manifestly combine with the preceding causes in occasioning concretions in the urinary apparatus. These conditions I have viewed above (§§ 45, 157.) as consisting of more or less manifest impairment, not only of the digestive and assimilating and depurating functions, but also of the vital endowment throughout the frame. This general impairment of vital power accounts for the prevalence of urinary excretions in delicate and in imperfectly or improperly fed children, or previously to puberty, and in the aged, and for the comparative rarity of these concretions in persons during the prime of life, or during the period of sexual activity, and in those who are neither overfed or under-fed, and who are not exposed to the remote causes above mentioned.

159. viii. *Bodies or substances introduced or passed into any portion of the urinary apparatus* are liable to become the nuclei, around which urinary concretions may form and increase by successive deposits. Numerous instances of bodies having passed into the bladder, and become the nuclei of large calculi, are recorded by medical writers. To these it is unnecessary to refer, as they are sufficiently known; but they satisfactorily prove that these bodies give rise to the first act of deposition or crystalline formation by the urine, when more or less loaded or saturated with the constituents of urinary deposit and concretion.

160. ix. *Morbid states of some part of the urinary passages* may be attended by an extravasation of a minute quantity of blood, or by a purulent or mucous discharge, which, either in the uriniferous tubes, or in the pelvis of the kidney, or in the bladder, may become the cause of deposit, by attracting the uric acid, the urates or other saline constituents of the urine, and form the nucleus of successive deposits. It is not improbable that a change, such as I have just stated, may take place in some portion of the kidney, or even in some other part of the urinary apparatus, owing either to external injury, or to other causes, and, by favouring the concretion of the superabundant saline constituents, or uric acid in the urine, thus form the nucleus of a renal calculus, which may either remain long in the kidney, and increase slowly, or pass into the bladder, and become, as in the case of a foreign body, the centre around which successive and large deposits collect. Most calculous concretions are thus formed, their nuclei and earlier deposits being formed in the kidneys, their chief increase taking place in the bladder.

161. *Inferences.*—The efficient causes of urinary calculi may doubtless operate differently in different diatheses and constitutions, and in different circumstances; more especially in determining the *nature of the deposit;* but there is some reason for *concluding,* — 1st. That a diet composed chiefly, or of a large proportion of animal food, tends to increase the quantity of the uric acid and urates, and to favour their deposition, and to lessen the generation and deposition of the phosphates; —2nd. That rancid and acescent ingesta, and rich sauces, exert nearly similar influences to the foregoing;—3rd. That whatever promotes the functions of the skin, tends to prevent the deposition of uric acid, and to favour that of the phosphates; — and 4th. That indolence and indigestion tend to increase the deposition of uric acid and to lessen that of the phosphates, both by producing acidity of the *primæ viæ,* and by impairing the functions of the skin and liver.

162. x. *The Origin and Growth* of urinary calculi was first clearly stated by Van Swieten (*Comm. in Aph. Boerh.* 1414.) He remarks, that "stones proceed from elementary principles, which, in a state of solution, previously existed in the humours; and when these meet with an indissoluble basis, they fix themselves thereto, and form a calculus, which continually increases in bulk from the application of fresh calculous matter." This statement is probably correct as far as it goes; but various topics connected with the original nature and primary formation of urinary concretions are not comprised in it. Dr. Golding Bird and others contended for an oxaluric diathesis, which gives rise to the secretion of oxalic acid and oxalates from the uric acid and urates existing in the blood. Dr. Owen Rees has opposed this doctrine, and has argued that the oxalic acid and its compounds are not produced from uric acid or from urates already existing *in the blood,* but that the change is effected *in the urine,* after its secretion by the kidney. "In this latter case the *uric acid* in combination will be secreted as such into the urine, but by after processes, occurring either in the urinary passages, bladder, or chamber vessels, it will present itself converted into a compound of the oxalic acid." If this be really the case, then we must admit that the state of system in which we observe a tendency to the formation of oxalate of lime in the urine must be considered identical with that accompanying the uric acid diathesis, and as requiring the same treatment, and the same precautionary measures.

163. Dr. Aldridge of Dublin has shown the manner in which uric acid and its compounds become decomposed into an oxalic salt. "He has proved that uric acid may be theoretically considered as representing the elements of oxalate and carbonate of ammonia, hydrocyanic and formic acids, if we merely add to its atoms the elements of water in varying proportions. He has demonstrated that this really occurs; for, by heating urine, and in some cases by evaporating it, he has succeeded in causing a deposit of oxalate of lime, while evidence of the presence of hydrocyanic and formic acids could be obtained from the fluid." (O. Rees, *on Calc. Dis. &c.* p. 5.)

164. *a.* The chemical reasoning, Dr. O. Rees remarks, which shows how unlikely it is that oxalate of lime should exist in the blood, is quite borne out by pathological conditions. He therefore concludes, in opposition to Drs. Garrod and G. Bird, that, whenever oxalate of lime is found in the urine, it should be regarded as *produced after secretion,* and that there is no such thing existing as an oxalic diathesis. Lehmann, who has also opposed the opinions of the late Dr. Bird, has stated that morning urine, left to stand some hours, often contains oxalate of lime in quantity, when the fresh urine did not contain any trace of it. Wohler and Frerichs found that the urates when injected into the blood produced oxalate of lime in the urine. Dr. O. Rees thus "regards oxalate of lime merely as uric acid, or urate altered after secretion," and that the lists of

calculi contained in museums will show that the uric acid diathesis produces nearly the whole of the calculous diseases observed, especially by forming the nuclei of most of those which are formed of other constituents.

165. The greatly increased quantity, and the insolubility of uric acid, are quite sufficient causes of the deposit of it in the kidneys, especially when in excess, and in the circumstances about to be noticed (§§ 167, 169.), without calling in the aid of any other agency. If the deposition of the uric acid in the calculous form in the kidneys, where it originally takes place in the great majority of cases, if not in all, and if the calculus, having passed into the bladder, "fail to produce any great irritation of the vesical mucous membrane, then it will be enlarged by the continued deposition of uric acid layers; but if, as is generally the case, this calculus irritate the surfaces, then the bladder becomes inflamed, and the mucous membrane throws out an alkaline fluid, which now decomposes the ammoniacal salts contained in the urine and liberates the ammonia. This may unite to a portion of uric acid, forming urate of ammonia, so that the next layers of the calculus may consist either entirely of urate of ammonia, or of that salt in admixture with uric acid. The changes may cease here, and the calculus, though it increase under these conditions, be thus compounded merely of two constituents. The next change may, however, occur, and may determine the formation of a more compound form of concretion; and this will consist in the pouring out of an *excessive* quantity of alkaline secretion by the inflamed mucous surface. This will not only completely neutralise the acidity of the urine, but cause—like all alkaline solutions—a precipitation of the earthy phosphates." (*Op. cit.* p. 28.) These will coat the calculus, intermixing or not with the urate of ammonia, or uric acid, according to the amount of secretion and its alkaline character.

166. *b.* In respect of the *Phosphatic Deposits* and *Concretions*, Dr. O. Rees further contends for their production uniformly from irritation or disease of the urinary mucous surfaces, and for the presence of uric acid or some other form of concretion being a sufficient cause for the formation of phosphatic layers on a calculus. In answer to the questions as to how phosphatic calculi are formed when *no* other calculous matter can be detected as a nucleus, and what were the conditions antecedent to the phosphatic deposit in such cases, he states that these calculi are rarely met with, and when present are the consequences of disease of the mucous membrane of the bladder, and where, of necessity, the alkaline secretion consequent upon irritation of this membrane is poured out from it in quantity. "This state of things often follows upon enlargement of the prostate with stricture, so that the bladder is not easily emptied." The retained portions of urine will have their earthy phosphates precipitated by the alkaline secretion of the diseased mucous membrane, and the formation of a calculous result. Hence it follows, — 1st., that the presence of other calculous matters, by irritating the bladder, causes a deposition of the earthy phosphates, these matters forming the nuclei around which the phosphates are deposited;—2nd, that the alkaline secretion from the irritated urinary mucous membrane occasions a concretion, independently of such nuclei, by precipitating the phosphates. It was long ago remarked by Dr. Prout, that these salts, when present, were always found covering other deposits, and rarely alternating with them; so that, if the nucleus were phosphatic, the crust would be the same, and no covering be found of any other form of calculous matter.

167. Since uric acid is the nucleus of the great majority of calculi, the conditions under which this deposit occurs should be considered. In persons subject to the continued excretion of uric acid and the urates, the quantities discharged may be very great, without showing any tendency in these substances to concrete into the calculous form. These materials may even give rise, from their abundance, to attacks of "gravel," without any considerable calculus being formed, and very common means may give relief. In other cases, the deposits in evacuated urine may be in far less proportion, and yet the tendency to concrete into calculi be very early shown. These facts, as Dr. O. Rees contends, seem to prove that, in order to produce a calculus, some condition must be present besides that which we recognise in a tendency to the deposit of solid matter from the urine. It is necessary to bear in mind what has been said above (§ 166.) respecting the chemical effect of the alkaline secretion from the inflamed urinary mucous membrane, upon which he places more stress than the proofs may be supposed to warrant. But besides possessing the imputed chemical qualities, Dr. O. Rees infers that the secretion from the inflamed membrane evinces mechanical conditions which must influence the result where a tendency exists to deposit solid matters from the urine, and that the secretion from the inflamed mucous surface, being of a tenacious character and containing fragments of epithelium and mucous corpuscles, will cause the particles constituting the deposit to unite and form a nucleus or concretion of successive deposits.

168. Instead, therefore, of viewing the earthy phosphates as secreted by the mucous membrane, Dr. O. Rees believes that this membrane acts merely through its alkaline secretion, which precipitates the earthy phosphates from the urine; and he further infers, that the same conditions noticed with regard to the bladder are present also in the kidneys, and that it is to these conditions in these latter organs, rather than to what exists in the bladder, that we ought to look for the chief cause of the formation of nuclei, and the very general origination of calculi in the kidneys. "At any rate this would appear to apply so far as the production of a nucleus is concerned." The mechanical conditions presented by the pelvis and urinary tubules certainly are far more favourable to the agglutination of deposits, than those observed in the bladder; for these are smaller conduits and cavities, and in the immediate vicinity of the tubules the first deposited matters are brought in intimate contact with the spheroidal epithelium, which under irritation rapidly desquamates and is more especially liable to entangle floating particles of deposit, and so to favour the formation of calculus. "The reasoning," Dr. O. Rees adds, "I have used with respect to the bladder, applies with full force to the formation and growth of calculi in the kidney. From what I have now

adduced, I would submit, that if we except cases in which are formed of the four following rare substances, viz., cystine, carbonate of lime, silicic acid, and uric oxide, we may consider all calculous disease as originating in the gouty or uric acid diathesis." (*Op. cit.* p. 38.)

169. A nucleus may form in any part of the urinary canals; but the tubules are by far the most frequent seat of the original deposit. Small particles are sometimes found in the secreting structure; and if these do not pass onwards to the tubular structure, they may increase by deposit of successive layers until a calculus of considerable size is produced. In this case a portion of the organ, corresponding to the development of the concretion, may be destroyed, and symptoms varying with circumstances be produced. The first deposit may, however, pass lower down into the tubular structure, or thence into the pelvis of the kidney, and either remain in either of these situations or pass along the ureter into the bladder, causing more or less distress, in some cases extreme suffering, during its passage; and having reached the bladder, it may be expelled through the urethra by the stream of water, or remain in the bladder and become the nucleus of a large concretion.

170. VII. SYMPTOMS OF URINARY CALCULI.—i. *In the Kidneys.*—The symptoms produced by a calculus or calculi in the kidney vary with the size, form, or smoothness of the stone, its situation in the organ, and the constitution, temperament, and diathesis of the patient. The calculus may remain in the kidney, or even several may remain, or pass thence into the bladder. If it remain, either relief of more or less severe symptoms may take place after a time, owing to a cystic covering forming over it, or disorganisation of the kidney sooner or later supervenes and destroys the patient. If the calculus remain in the kidney and become encysted, more or less severe pains in the loins or in one or both sides, often extending down the thigh or thighs, and sometimes upwards under the shoulder blades, colicky pains in the abdomen, nausea, vomiting, hæmaturia, and frequent calls to pass the urine, are complained of. These symptoms may gradually subside, and they may recur oftener than once, after indefinite periods and with various degrees of severity, especially after sudden or severe exertion, particularly when the trunk of the body has experienced a shock or concussion. The pain often becomes dull or aching, or is seated chiefly on one side of the abdomen, or extends to the groin, or a sympathetic pain, resembling neuralgia, is experienced at a distance from the region of the kidney, and not infrequently extends to the testicle of the affected side. After a lengthened period, and after frequent recurrences of the symptoms in slighter grades, the patient either experiences an immunity from further suffering, or complains only of slight and wandering or recurring pains, which often may be traced to one or other kidney.

171. In less favourable cases of retention of the calculus or calculi in the kidney, the symptoms assume the features described when treating of *Inflammation of the Kidney* (§§ 48, 49. 69. *et pluries*), and of *Pyelitis* (Art. KIDNEY, §§ 174—183. 192—198. *et pluries*), and are fully described, with the several relations of this subject, in the article, and more especially at the places now referred to. I may, however, remark at this place, the difficulty of diagnosis between a calculus in the right kidney and the passage of gall stones. At the commencement of the irritation produced by a calculus in the right kidney, and when the symptoms are very severe, or when a calculus has entered the ureter from the pelvis, the complaint may readily be mistaken for gall stones, especially when the vomitings, pain, and spasm are very urgent, and if all the symptoms be not carefully examined. I have found it even recently very difficult to determine at first as to the seat of disease; and this difficulty is increased if there be, as there frequently is, pre-existing disorder of the biliary functions, more especially interruptions of the biliary secretion, or some degree of jaundice. As the symptoms of renal calculi proceed, and especially as the calculi pass into or along the ureter, the nature of the complaint becomes more manifest, and indeed is most frequently so from the commencement, especially when the symptoms attending the secretion and excretion of urine are well marked, and blood-globules are observed in the urine. When the hæmaturia is very considerable, especially after exertion or sudden movement of the trunk, in connection with the other symptoms of *calculous nephritis* (see KIDNEY, § 48 *et seq.*) the nature of the case is evident; and if the draining of blood continue for a considerable time, and the local symptoms are very acute, the oxalate of lime calculus is not infrequently its cause.

172. ii. The *Diagnosis* of renal calculus is rendered most difficult in the gouty and rheumatic diathesis, and in cases of chronic disease of the urinary bladder and prostate gland; for the pain in one or both sides of the lumbar region may be rheumatic or gouty, or may proceed from cachectic nephritis, or BRIGHT'S disease, or from pyelitis or abscess of the kidney, occurring either primarily or caused by calculi or following chronic uro-cystitis or stone in the bladder, or even from inflammation or abscess of the lumbar muscles. If any tumour or swelling be detected in the region of the kidneys, the antecedent symptoms should be duly estimated, and the examination directed to the existence of collections of matter in the pelvis and calices of the organ, or to their distention by urine from obstruction of the ureter, or to the presence of malignant disease of the kidney. Of these several states of disease, as well as of the passage of a calculus along the ureter, no correct diagnosis can be formed until the urine be tested, and the results considered with due reference to the quantity, specific gravity, appearances, deposits, and quality of this secretion; to the ability of retaining it, to the frequency of the calls to void it, and to the particular alterations of sensibility complained of in the regions of the kidneys, ureters, bladder, and urethra, as well as in the testes, abdomen, and lower extremities, and to the states of constitution and of vital power. In the course of renal disease associated with calculi, the symptoms are so varied, and manifest so numerous combinations, with the seat, duration, extension and associations of morbid action, that descriptions applicable to all cases would be hopeless; but, by recollecting that irritation existing in one part of the urinary apparatus will extend to, and more or less affect the whole; that although the symptoms will be present chiefly in the situations just indicated, they may extend

still further; and that a correct examination of the urine will indicate with more or less accuracy the nature of the affection, especially when viewed in connection with the local and constitutional symptoms, the difficulty of forming a diagnosis between the disorders which result from renal calculi and those which most nearly resemble them will altogether disappear. In this subject I must refer the reader to what I have stated respecting the inflammatory and organic diseases of Kidneys and Urinary Bladder, and the complications which they present in practice.

173. iii. The *symptoms* indicating the *passage of a calculus from the kidney to the bladder* may be so slight, especially when the calculus is small and smooth, as to occasion but little inconvenience and to excite no anxiety or even the attention; and it may remain long afterwards in the bladder without the patient being aware of its presence. But if the renal calculus be large, or rough, more especially if it be an oxalate, its passage along the ureter is attended by the most excruciating suffering. The pain is seated more especially in the loins, generally of one side, extends from the course of the ureter and down the thigh, the chord to the testes; and is attended by retching, vomitings, and by intermitting colicky or abdominal pains. The patient is bent double, or to one side, rolls about, and is in the greatest agony. In the less severe cases there are rigors, nausea, restlessness, pain in the back, stretching in the course of the ureter to the bladder, thigh, and testicle, often with its retraction, coldness of the extremities, and prostration. The descent of the calculus commonly occupies from 12 to 24 or 36 hours. "The calculus may become impacted in the vesical orifice of the ureter; the flow of urine from the corresponding kidney may then be prevented; dilatation of the ureter, and distension of the tubular structure of the kidney will ensue, terminating in absorption of its secreting surface; but most of the usual symptoms of stone in the bladder will be absent.

174. iv. *The symptoms of a calculus in the bladder* are well known, and require at this place but few remarks. But in tracing back the history of these cases, and when inquiring into their existing states, the facts should not be overlooked, — 1st, that stone in the bladder originates, in the great majority of cases, in a calculus formed in the kidney, which, having passed into the bladder, forms the nucleus of further deposit and concretion in this organ; — 2nd, that the formation of the calculus in the kidney, and its passage thence along the ureter into the bladder, must have been attended by more or less ailment referable to these situations; —3rd, that a calculus very rarely or never originates in the bladder without previous disease either of this viscus, or of the prostate gland, or of the urethra.

175. The *symptoms* chiefly characterising the existence of a *concretion in the bladder* are frequent calls to micturate, pain at the end of the penis, hæmaturia, especially after exertion, and pain with or without hæmaturia on a jolting motion or succussion of the trunk. If these, however, be alone recognised, they may mislead the physician; for they may all be present, and yet a calculus may not be present in the bladder. Hence the necessity of inquiring into the history of the case, and of duly estimating the early symptoms. For some malignant growth may exist in the bladder and occasion all the symptoms just mentioned. A calculus in the vesical cavity generally falls behind the prostate, but it shifts according to the posture of the patient. In the earlier stages of vesical calculus, the viscus being yet healthy, a dull pain, with a sense of weight about the neck of the bladder, or uneasiness, extends to the hypogastric region, perineum, groins, or thighs. If the stone be smooth, the symptoms commence and advance so slightly and slowly as to excite but little attention and no anxiety; but sooner or later, either from the size of the calculus or the irritation produced by it, the features of the affection become manifest. The bladder is irritable and cannot contain its contents; the calls to micturate are more frequent; and the expulsion of the last drops is attended by pain, shooting along the perineum and penis, and centring in the glans. Sometimes when the urine is flowing in a full stream, it is suddenly stopped, as if by some body falling into and obstructing the orifice of the urethra. Exercise, sudden movements, and the jolting of a carriage occasion great suffering, and even a discharge of bloody urine, which in plethoric or other habits of body may be of considerable extent or continuance; as the disease continues, and the bladder becomes more affected, micturition becomes more and more frequent and distressing. Patients often grind their teeth with agony; and the last drops of urine are expelled with spasm of the bladder which endures for some time. The urine and contents of the vesiculæ seminales are sometimes passed involuntarily, and increase the distress and exhaustion of the patient. There is occasionally priapism, with or without sexual desire.

176. I need not further describe the symptoms of vesical calculus, but merely briefly advert to the importance of recognising some of the *complications* of this malady, and which may either precede it, or follow it, more especially the latter. Of these the most important is disease of the kidney or kidneys. This may have preceded the vesical calculus, and been associated with, or caused by, the formation of the renal calculus, which formed the nucleus for further deposit and concretion when it passed into the bladder. But in this state of complication the renal disorder is generally slight, or even hardly exists when the calculus has reached the bladder. If, however, it be arrested in its course, more particularly at the vesical extremity of the ureter, the renal complication may be most severe and dangerous. After the calculus has been long in the bladder and superinduced much disease in this viscus, the interruptions in the way of urinary excretion, the extension of irritation along the ureters, and other circumstances, often develope serious disease, and even extensive disorganization of the kidneys. In some cases, also, the irritation of the bladder by a calculus may superinduce prolapsus ani in children or even in older subjects, and hæmorrhoids in the latter class.

177. v. *Diagnosis.* The symptoms described above (§§ 174—6.) generally lead to the important measure of ascertaining, beyond a doubt, the existence of a stone in the bladder, viz. *to sounding*. The circumstance of malignant disease of the bladder being often attended by most of the symptoms characterising vesical calculus; and the fact of this

operation, which is so requisite in the latter malady, being often most injurious in the former, should lead us to pause before it is resorted to, and the states and appearances of the urine very minutely examined. In cases of vesical calculus the urine generally contains more or less of the ordinary sedimentary and organic matter, and the blood discharged with the urine is generally in smaller quantity than in malignant growths in the kidneys or bladder.

178. In calculus, hæmaturia generally follows upon some unwonted exertion. In malignant growths in the bladder or kidneys, the tendency to nausea and vomitings is greater, and there are more marked appearances of cachexia and of anæmia than in calculus. In some cases, also, a careful examination of the abdomen will lead to the detection of tumors, if there be malignant disease of the kidneys, especially after the bowels have been freely evacuated. Malignant disease of the kidneys or bladder, or fungoid growths in the latter, especially when far advanced, is characterised by discharges of urine, with much blood, intermixed with which the cells constituting malignant disease may be detected by the aid of the microscope. Dr. Owen Rees reposes much confidence in the evidence furnished by these cells, of the existence of such disease. He describes them to be "of variable size, the smaller being about four times the diameter of a blood corpuscle, the larger twice that size, or even of greater diameter. They are colourless and more transparent than the white corpuscles of the blood, and contain within them nuclei of varying size. These nuclei differ in number in each cell. Sometimes one only is present; sometimes four or five. Though there would appear a general tendency on the part of these bodies to assume the circular form, they are for the most part of irregular outline. Sometimes a mass of them may be seen agglutinated together, and then they are more or less square, or they may approach to the hexagonal form." Dr. O. Rees states that he has never seen corpuscles like these in the urine, except in cases of malignant disease. Where these are found, he contends that the sound should never be introduced into the bladder, as it may be followed by excessive, or even fatal hæmorrhage, a case of this latter issue having fallen under his observation.

179. VIII. Treatment of Urinary Concretions. — i. *Of calculi in the kidneys.*—When the symptoms indicating the existence of calculi in the kidney are severe, and the patient is strong or plethoric or not reduced by hæmorrhages from these organs, then cupping over the loins, followed by warm baths and fomentations, will afford relief. The preparations of soap and extract of henbane, or of belladonna, may be prescribed internally, whilst mucilaginous or demulcent fluids, containing the carbonates of the alkalies with narcotics, should be freely administered. The bowels ought to be kept open by means of olive oil, in frequent doses; or by the citrate of potash taken freely, in a state of effervescence, and with the alkali in excess. If hæmaturia be excessive, the acetate of lead with opium, or the spirits of turpentine, cautiously exhibited in small doses, epithems of the same being applied to the loins, will be found of service; or the gallic or tannic acids, &c. may be prescribed. In cases where it might be injurious to abstract blood, dry-cupping over the loins may be employed.

180. Having removed the more severe symptoms by these or similar means, a course of medicines calculated to prevent the formation of uric acid and urates, and to lessen their irritating effects, should be entered upon. But such a course will prove ineffective if the diet and regimen of the patient be neglected. The citrate and bicarbonate of potash, the citrate or carbonate of magnesia, and other antacids, conjoined with tonics, will generally be of service, both in preventing acidity and promoting digestion, and in depurating the blood. A vegetable and farinaceous diet should be adopted, the quantity of flesh-meats much diminished, and the white kinds of fish, boiled only, and with no other sauce than a squeeze of lemon, should replace a large portion of the other articles of animal food usually taken. The beverage of the patient may consist of any of the mineral waters in which the alkalies most abound; or distilled water may be drank, when effervescing with the bicarbonate of potash and citric acid or lemon juice, or with the addition of either the citrate of potash or citrate of magnesia, according to the state of the bowels. When the bladder is irritable the several kinds of soap, with henbane, or with opium, may be taken at bed-time. In all these cases, I have seen much benefit result from the use of distilled water, as the vehicle for depurants of the blood, and for the important domestic purposes of making tea, coffee, &c. The due promotion of the functions of the skin, in this class of patients, and the use of the warm bath, of flannels next to the skin, should not be overlooked.

181. ii. *The Treatment of the passage of renal calculi* is often of urgent importance, owing rather to the agony produced than to the danger incurred. The sufferings of the patient are generally increased in these cases by constant or frequent retchings, which also require to be assuaged. A warm bath should be immediately ordered, and before it is ready, or while it is being prepared, from 40 to 50 minims of laudanum, or a lesser dose of Battley's solution of opium, may be given. If the symptoms be still severe, and the vomitings continue after the patient's removal from the warm bath, creasote may be prescribed with demulcents, or other substances; or hydrocyanic acid, or chloroform, may also be added to these. The warm bath may be repeated, or warm fomentations be employed, and emollient and mucilaginous fluids, containing alkaline carbonates, and anodynes be freely taken. If the patient's sufferings be not very considerably relieved by these, the extract or tincture of belladonna may be added to the pills or mixtures already advised, and to the fomentations, which should be continued until complete relief is obtained.

182. During the passage of calculi from the kidneys the state of the urine should be carefully ascertained, and the bowels satisfactorily evacuated, either by magnesia or the citrate of magnesia taken in demulcent vehicles, or by oleaginous enemata, administered in large quantity, and repeated as they may be required. After relief is obtained, the medical treatment advised for renal calculi should be persisted in for some time conformably with the indications furnished by the appearances and deposits of the urine. The diet

and regimen recommended above (§ 180.) should be continued throughout, or modified according as the state of the patient and the alterations in the urine may suggest, due care being taken not to reduce the digestive and the assimilative functions, not to lower vital or constitutional power, and not to impair the secreting and depurating actions.

183. *The treatment of vesical calculi* differs but little from that advised. The avoidance of exertion or of sudden movements, &c., as advised for renal disease, strict attention to diet, and the adoption of the medical treatment recommended for the several kinds of urinary deposit, conformably with the kind existing in the urine, and for renal concretions, are also required for vesical calculi. In many cases, however, the irritation produced in the bladder, the consequent inflammation, hæmaturia, &c., and the complication of disease of the kidneys, of the prostate, &c., render the treatment most difficult, and its benefits often doubtful, however rationally conducted. It is unnecessary to add at this place to what I have already stated when describing the treatment of diseases of the URINARY BLADDER, and of the KIDNEYS, and when noticing the indications of cure furnished by URINARY DEPOSITS. When a stone exists in the bladder and produces irritation of more or less manifest severity, the probability of that irritation being followed by the consequences just named, however judicious the medical treatment may be, is very great; and hence the necessity of removing the stone by a surgical operation, unless the consecutive diseases or lesions, — the superinduced complications, forbid its performance. As to this and other topics connected with the surgical treatment of vesical concretions, I must refer the reader to the very able surgical works enumerated in the subjoined BIBLIOGRAPHY and REFERENCES.

184. IX. DISEASED EXCRETION AND SUPPRESSION OF URINE.—The urine may be voided not only in the very different degrees of quantity, and in the states of chemical constitution described above as indications and important parts of disordered vital function, and of local disease, but it also may be discharged with more or less effort and suffering on the part of the patient. It may, moreover, be retained in the bladder, owing either to paralysis and over-distension of the organ, or to mechanical obstacles at the neck or outlet of the viscus, or in some part of the urethra. The urine is also often either secreted in remarkably small quantity, or suppressed altogether, owing to disease of the kidneys, the blood and nervous masses becoming poisoned by the arrest of the important depurating function of these organs, and by the resulting excrementitial plethora of the vascular system, and accumulation of urea, &c., which these organs eliminate from the blood as long as these functions continue. An altered or poisoned state of the blood may also arrest the functions of the kidneys.

185. ii. *Difficult excretion of urine, urinæ difficilis excretio*, or *Dysuria* (from δυς, difficult, and *ουρον*, urine), is entirely symptomatic of disease affecting some part of the urinary apparatus, or some organ or part in the vicinity. It is generally characterised by heat and pain, as well as difficulty and delay, in procuring the discharge. *Dysuria* may depend upon the properties or chemical constitution of the urine, especially in irritable states of the urinary bladder and urethra; and, in such cases, as well as in others where these properties are not present, it may be symptomatic of disease of the kidneys, especially of inflammatory and organic diseases. Most frequently, however, it is a symptom of the diseases of the urinary bladder, and of the urethra, and of gravel and urinary concretions. It is not infrequently present in diseases of the neck and body of the uterus, in the severe cases of dysmenorrhœa and leucorrhœa; in dysentery and inflammation of the rectum, and in cases of inflammatory hæmorrhoids.

186. ii. *Strangury, stranguria* (from *σταγγειν*, to squeeze, and *ουρον*, urine), is a more severe degree of the preceding complaint, and is most frequently a symptom of diseases of the urinary organs, more particularly of over-distension of the bladder, of lesions of the neck of the organ and prostate gland, and of the urethra, and of urinary calculi and gravel. In dysuria the urine may flow in a full stream; but in strangury it is much interrupted, or passes in small quantities, or in drops, after great effort.

187. iii. *Ischuria* (from *ισχω*, I arrest, and *ουρον*, the urine) has usually implied, an arrested discharge of urine; the arrest taking place either in the *kidneys* — *ischuri renalis*; *anuria* (WILLIS), renal ischuria; or in the *bladder*, from paralysis of the organ, or from some obstruction at its outlet — *ischuria vesicalis*, *I. vera*, *I. retentionis*, vesical ischuria; or in the urethra — *ischuria urethralis*, from stricture, phymosis, &c. Besides those symptomatic states of ischuria, or of retention and suppression of urine, other forms of retention arising from calculi, and from disease of, or tumours in, the uterus or vagina, &c., may be enumerated. This subject is more fully discussed in the article SYMPTOMATOLOGY (see §§ 210 — 218.); but there is one part of it, and that of the highest importance, which requires a more particular consideration, namely, *Ischuria Renalis*, *Anuria*, of Dr. WILLIS, or *Suppression of Urine*, the excretion not being eliminated by the kidneys, urine not being secreted.

188. iv. *Suppression of Urine* is always a symptom of pre-existing disease, but of so many, and of so dangerous maladies, as to require a short notice at this place. It is very doubtful whether or no it ever is a primary or idiopathic malady, in the strict acceptation of the word; although it occasionally deserves this rank as much as some others which have been so denominated. It is often observed in the course of pestilential maladies, more especially in the severer grades and advanced stage of *pestilential cholera*. It is also not infrequent in the *Hæmagastric Pestilence*. It sometimes occurs as a fatal, or at least a most dangerous symptom of exanthematous fevers, more particularly of *scarlet fever*. In these, and in other continued fevers, in which it is occasionally observed, suppression of urine has been either too often overlooked, or not viewed with due consideration. In all these maladies it may be either *partial* or *complete*. In either case, the consequences, as respects the blood, nervous system, and structures generally, may be readily inferred. It also frequently supervenes, either partially or completely, in cases of inflammation, acute or chronic, of the kidneys, and of organic lesions of those organs, most frequently of *granular disease*, or

cachectic inflammation of the Malpighian bodies, but most generally in a partial or incomplete form. *Suppression* of urine is a more complete or rapidly dangerous or fatal form; often follows injuries and diseases of the spinal chord or its membranes, although *retention* is a more common result; and it is not an infrequent consequence of various modes of poisoning, owing either to inflammatory action or congestion thereby induced in the secreting structure of the kidneys, or to a paralysis of the ganglia and nerves supplying these organs.

189. *A. The symptoms* caused by *suppression of urine* vary with the circumstances of the case, and more especially with the slowness or rapidity with which suppression takes place, and with the disease of which it is a consequence.—*A.* When this condition proceeds from granular lesions, atrophy, or other organic change in the kidneys, it is generally slow in its progress, and it is often not observed, or rather the diminished excretion of urine has been of considerable continuance, before it has attracted notice; the urine being not only very scanty, but also very much altered from the healthy state, as shown in the articles on Dropsy and diseases of the Kidneys, and in the preceding sections. In these cases, with the slow progress of diminution of urine and of the solid constituents of this excretion, the cutaneous and pulmonary exhalations are sometimes increased, and their odour is most offensive; effusion often gradually supervenes in the cellular tissue and in the shut cavities, sometimes with evidence of a chronic inflammatory irritation of the serous membranes investing these cavities; and ultimately the dangerous and commonly fatal phenomena rapidly supervening upon the acute form of suppression, or of that occurring in the advanced stage of malignant maladies, make their appearance.

190. *B.* When suppression of urine takes place more rapidly, the disease is then characterised by many of the symptoms of continued fever. There are pains in the back, but chiefly in the loins and in the lower extremities, with nausea and vomiting, and often with a sense of weight or of uneasiness if actual pain or severe aching in these situations be not felt. In some cases vomitings are urgent, and the fluid thrown up is generally watery, and in a few instances has an urinous odour. The pulse is rapid, full, and distended; perspiration, at first scanty, becomes more copious, in some instances abundantly so, and ultimately it has often an offensive urinous odour. After a time varying from three to five days, or occasionally longer, effusion takes place in the cellular tissue and shut cavities, with a tumid or bloated state of the countenance, especially about the eyes. In cases of somewhat longer duration, œdema of the face and extremities comes on and advances more slowly; but as these changes advance, sopor supervenes and passes into profound coma, and sometimes into coma terminating in convulsions, especially in children. Generally long before these symptoms appear, either the extreme diminution of the quantity of urine, or its entire suppression, has been recognised by the physician, if he have been consulted so early; and when the catheter is introduced to determine correctly the existence of urine in the bladder,—the presence or absence of which, however, is generally evinced by the state of the hypogastric region, — nothing beyond a very minute portion of a thick, muddy, or mucous and offensive urine is withdrawn. This form of suppression of urine, whether occurring primarily, as I believe I have seen it in a very few instances, or in the early progress of other diseases, or in the gouty diathesis, or as a consequence of misplaced or suppressed gout, may be ascribed to a state of congestive inflammation of the secreting structure of the kidneys, in which the organic nervous or vital influence of these organs is rapidly exhausted or suppressed.

191. *C.* When suppression of urine, or anuria, occurs in the advanced progress of malignant or pestilential maladies, the duration of the symptoms more especially appertaining to it is much shorter, and the course of the malady in which it appears is very much hastened by it to a fatal issue. The changes usually consequent upon the anuria often do not take place until shortly before death; the earlier effects of the lost function of the kidneys being chiefly an aggravation of all the symptoms and diagnostic characters of the malady in which it occurs. It is very remarkable in the case of malignant scarlet fever and pestilential cholera and yellow fever. Very soon, however, generally in a day or two, and often after a few hours, as in pestilential cholera, sinking, sopor, convulsions or coma, &c., occur and terminate life; œdema of the face and extremities, effusion within the cranium, &c., also taking place shortly before death in scarlet fever, and sometimes in the hæmagastric pestilence. In pestilential cholera, the watery discharges from the stomach and bowels prevent the excrementitial plethora of the vascular system from taking place, that occasions the coma, effusion, &c., which are usually the results of anuria, when it supervenes in the course of other acute maladies.

192. *D.* Drs. Willis and Schönlin described a form of anuria which sometimes occurs in weak and cachectic children, and which I have observed also in the children of the poor living in cold, damp, or low situations. In these the digestive mucous surface is much disordered; the secretions and excretions are acid and offensive, and the cutaneous surface is affected by various eruptions, chiefly erythematous, vesicular, and pustular. The urine is scanty, is sometimes more or less albuminous, is voided in drops after short intervals, with pain and difficulty, and is ultimately quite suppressed. The pulse is at first quick and weak, but it gradually becomes slower, as sopor, coma, or convulsions supervene. These symptoms are usually preceded by constipation, by œdema of the face and extremities, by vomitings and retchings, and are ultimately followed by death. In some cases, especially when perspirations are abundant towards the close of the disease, this excretion has an urinous or an acid and offensive odour. The breath also often has a similar odour.

193. *E. In fatal cases* of rapid or sudden suppression of urine, and when this event occurs in exanthematous and malignant diseases, the kidneys are found of a very dark colour, from the congestion of dark blood, or they present a livid or bluish-brown tint; or they are flabby, enlarged, and friable. These changes are most remarkable in the secreting structure, the tubuli being often filled with epithelian débris. In malignant scarlatina, suppression of urine presents appearances in the kidneys described when treating of Scarlet

FEVER (see § 66.). In the slower or more chronic cases, the appearances are altogether the same as those stated when treating of granular or *cachectic inflammation of the* KIDNEYS (§ 99. *et seq.*). The changes in the cases of suppression of urine in children, which I have had an opportunity of observing, were similar to those which I have mentioned under the head of scarlet fever. Indeed, in some of these cases I had viewed the disease as an abortion or latent state of scarlet fever, in which the affection of the throat and skin had not appeared, as I have described it in that article. (See §§ 26. *et seq.*)

194. It is manifest that the fatal result, in cases of suppression of urine, arises from two pathological conditions: — 1st, from the excrementitious plethora of the vascular system, the superabundance of the watery element causing effusion on the brain, its membranes, cellular tissues, and shut cavities; and, 2nd, from the accumulation of urea, uric acid, &c. in the blood, which poisons the nervous masses and vital structures, thereby aiding the destructive effects of effusion, or even proving fatal independently of these effects.

195. *F. The treatment* of suppression of urine is rarely encouraging, owing to its want of success, and the fatal results which surely follow the very general failure of it. Yet treatment should not be neglected, as it may succeed in a few or rare cases. Besides, hopes of success may be reasonably entertained, if the suppression be incomplete. In cases occurring in acute, exanthematous, malignant or pestilential maladies, the small quantity of urine passed before complete suppression takes place may or may not be albuminous, and of diminished specific gravity; it is sometimes thus altered in scarlet fever, but it is not, as far as I have seen, in other malignant diseases. In these, if the state of the pulse and other circumstances allow, the patient should be cupped on the loins, and the operation repeated, to an extent according to the features of the case and the effect produced. If the loss of blood cannot be hazarded, dry-cupping should be adopted; and the patient, under all circumstances, should be placed in a warm bath, rendered more or less alkaline by the addition of the carbonate of potass or soda. After leaving the bath, a turpentine epithem or embrocation may be placed over the loins, or an embrocation consisting of equal parts of the compound turpentine and camphor liniments should be applied in the same situation, or over the abdomen. The bowels must be kept freely open by the more diuretic purgatives, and by terebinthinate or other enemata; and diuretics should be taken, variously combined, or conjoined with sedatives or anodynes, according to circumstances, more especially the preparations of taraxacum, of digitalis, of scoparium, &c.; the carbonates, the nitrates, the acetates, the tartrates, the bitartrates, and the bi-borates of the fixed alkalies, in large doses, or in as large as the stomach will tolerate. If these fail, the following may be tried as a *dernier ressort*: —

No. 364. ℞ Olei Terebinthinæ ʒ ij.; Spirit. Ætheris Nitrici ℥ss.; Spirit. Juniperi Comp. ℥ss.; Olei Cajuputi ♏ xx; Potassæ Nitratis ʒj.; Pulv. Tragacanth. Comp. ʒ iij.; Pulv. Glycyrrh. ʒ ss.; tere bene et adde Syrupi Rosæ, Syrupi Tolutani, āā ʒ jss.; Aquæ destillatæ ad ℥ viij. Misce bene. Sit mist. cujus capiat Cochl. ij. larga, 3tiis, 4tis, vel 6tis horis, prius agitata phiala.

If the vomiting preclude the retention of these medicines, a very small quantity (½ or i minim) of creosote may be added, or from three to six drops of tinctura opii, to each dose, or both may be given in addition, and the terebinthinated embrocation applied over the epigastrium. When suppression of urine follows chronic disease of the kidneys, complicated with dropsy, and more especially when it is associated also with organic disease of the heart, then little or no permanent benefit will be derived from any means of treatment; those just mentioned being the most appropriate, and sometimes affording temporary benefit.

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The BIBLIOGRAPHY of URINE, URINARY DEPOSITS, and CONCRETIONS, *especially of the Causes, Symptoms, and Treatment of Urinary Concretions*, is the most extensive of any branch of Medical Literature. I have mentioned only a few of the best works and memoirs on these subjects; but those who desire to be further informed, will find numerous other references in PLOUCQUET'S *Literatura Medica Digesta*, articles *Calculus Urinarius* and *Urina*; in the *Repertorium* of J. D. REUSS, arts. *Calculus Urinarius*, vol. xii. pp. 178—217, and *Urina*, vol. xv. pp. 134—174; and in the *Appendix* to Mr. CROSSE'S able and laborious work, referred to above. Most of the References I have adduced are, however, not contained in these works.

URTICARIA. — SYNON.: — *Urticaria* (from *Urtica* a Nettle, the eruption resembling that caused by it); — Swediaur, Vogel, Willan, — *Febris Urticata*, Vogel; — *Exanthema Urticatum*, Borsieri; — *Scalatina Urticata*, Sauvages; — *Purpura Urticata*, Juncker; — *Uredo*, Linnæus; — *Essera*, Heberden; — *Erysipelas Urticatum*, *Exanthesis Urticaria*, Young; — *Epinyctis pruriginosa*, *Aspretudo*, Auct.; — *Exanthesis Urticaria*, Good; — *Nesselfieber*, *Nesselsucht*, *Nesselauschlag*, Germ.; — *Fièvre Orliée*, Fr.; — *Orticaria*, Ital.; — *Nettlerash*.

CLASSIF. — ORDER GENUS (Willan) III. CLASS. I. ORDER (*Author.*)

1. DEFINIT. — *A febrile, non-infectious exantheme, characterised by an eruption of prominent wheals or spots, paler or redder, or even both, than the surrounding surface, rarely of long continuance, often recurring or becoming aggravated in fits, and always attended by a burning and stinging sensation.*

2. I. DESCRIPTION: — Dr. WILLAN has enumerated six species of Urticaria: — 1st, Urticaria *febrilis*; — 2nd, Urt. *evanida*; — 3rd, Urt. *perstans*; — 4th, Urt. *Conferta*; — 5th, Urt. *Subcutanea*; and 6th, Urt. *tuberosa*. These have been arranged by M. RAYER under two heads, according as their course is *acute* or *chronic*.

3. i. URTICARIA ACUTA. — The *first variety* under this head is the *Urt. febrilis*, which is generally caused by the ingestion of various articles, and frequently by shell-fish (see §§ 427. *et seq.*); and is to be imputed rather to a peculiar susceptibility or idiosyncrasy of the individual than to any noxious or poisonous quality in the article occasioning the eruption. Commonly in an hour or two after the ingestion of the article causing this affection the patient complains of a weight at the epigastrium, of nausea, sinking, or giddiness. These are followed by febrile symptoms, by heat of skin, and by the appearance of an eruption on the shoulders, breast, the loins, the inner sides of the arms, thighs, &c., generally consisting of reddish or whitish elevated spots, surrounded by bright crimson areolæ. The spots are generally irregular, but sometimes circular, varying in size, and elevated above the surrounding surface. When numerous in any part they are often confluent, the skin presenting a red tint, and being stiff and swollen (*Urt. Conferta*). The eruption is attended by distressing itching, pricking, or stinging, especially during the night; and sometimes the confluent variety is associated with erythematous blotches. When this form of the disease is caused

by shell-fish, or by poisonous ingesta (§§ 427. 434.) the eruption is sometimes preceded or attended by vomiting or purging, or by both; and spasms, sensations of choking or suffocation, convulsions, sinkings, &c. have even supervened, and in rare instances terminated fatally. In the slighter cases of urticaria, caused by the ingesta, the white itching elevations of the skin are not observed; a simple efflorescence, resembling scarlatina, and belonging rather to erythema than to urticaria, being the characteristic symptom. After twenty-four, thirty-six, or forty hours the eruption usually declines, and soon afterwards leaves only slight traces on the skin, which are effaced in a few days.

4. Febrile urticaria sometimes appears without any appreciable cause, excepting teething in children, and intense moral emotions in adults. The symptoms are nearly the same as those caused by the ingesta, excepting that vomiting and purging are not observed, that the febrile symptoms continue longer, usually a week or longer, and that the eruption is less general, but appears and disappears in almost all parts of the surface, preceded by slight febrile symptoms. The patient can often excite spots of urticaria by friction; but these generally disappear in a few hours. In some instances the rash continues for two or three weeks (*Urticaria perstans*, Willan) and is attended by anorexia, functional disorders of the digestive organs, febrile symptoms, general depression, malaise, &c. The eruption usually declines imperceptibly, but it often returns with itching in different parts, and it last disappears. When urticaria has been severe, or has continued long, a slight desquamation generally follows.

5. ii. Urticaria Chronica.—Chronic urticaria often lasts for months. M. Rayer states that he has known it continue for several years. This form of the disease is most frequent in females, and in persons with a delicate or sensitive skin. Although most common in those who complain of disorder of the digestive functions, yet it sometimes occurs in persons who are otherwise in good health. The eruption appears at irregular intervals, sometimes in one place, at other times in another (*Urt. evanida*, Willan), without fever, and often for a few hours only. The patches are generally irregular, and closely resemble the wheals produced by flagellation. They have no erythematous areolæ, and are attended only by severe pruritus. In some cases, instead of itching, a stinging or pricking sensation under the eruption is experienced (*Urt. Subcutanea*, Willan). In these the eruption is scanty, consisting of a few red points, but little elevated above the surface, and a small number of spots, that appear at very remote intervals. M. Rayer considers this form of Urticaria to be very uncommon, and to be caused by violent moral emotions.

6. A severer variety of nettlerash sometimes appears (*Urt. tuberosa*, Willan). It consists not merely in slightly prominent elevations, but in true tuberosities of various sizes, which are hard, deep-seated, extending to the subjacent cellular tissue, attended by slight ecchymosis, and by a tense and sore state of the limbs. These tuberosities generally appear in the evening or at night, with itching and stinging, and disappear before morning, leaving the patient weak, restless, and depressed. They occur more particularly on the loins and extremities; but they may come out over the whole of the body, causing swelling of the neck, limbs, and even the face; and are attended by various symptoms, as dyspnœa, irregular action of the heart, &c. They are usually developed with febrile action, and subside with the remission of the fever, reappearing with its accession (*Febris intermittens Urticata*, Frank).

7. The varieties of chronic urticaria are very irregular in their courses. They sometimes disappear for several days, and reappear with or without an appreciable cause, after uncertain intervals. They often are not entirely removed for many months, in rare instances, not for some years; and either spontaneously or by a methodical plan of cure. Turner, Heberden, Rayer, and others, mention cases which continued many years. I have recently attended a case with Mr. Pettigrew, which resisted for above a year the most active treatment. When the eruption of these chronic forms of the disease is very severe, it is followed by a bran-like desquamation, constitutional symptoms of varied characters and severity being present, or recurring irregularly.

8. *The Associations* of Urticaria are common, and often important. With constitutional disturbance and disorder of the digestive organs, often depending upon an improper regimen and diet, urticaria is very generally associated. J. Frank saw it *complicated* with quotidian and tertian agues, at Pavia, in May and June, 1794; and at Wilna, in March and April, 1812, in so many cases as to appear epidemical. In acute rheumatism the wheals of urticaria may appear, although not so frequently as the efflorescence of erythema or roseola. Nettlerash is uncommon in connection with diseases of the respiratory organs and passages. It is sometimes observed during various chronic visceral diseases, or cancerous and organic maladies; and after miscarriages occurring in nervous females. Urticaria may be complicated with other cutaneous eruptions, especially with erythema, or with roseola, or with lichen, and occasionally with impetigo. Wichmann saw it associated with variola; Hufeland with measles; Rayer with prurigo; and I have seen it in a case of jaundice, and in another of senile prurigo.

9. ii. The Causes of urticaria are most frequently articles of diet, which, owing to their unwholesome or indigestible natures, or to idiosyncrasy or peculiarity of susceptibility, disorder the digestive and assimilating organs; and which, by passing into the circulation, excite more or less febrile action, and affect the capillary vessels of the skin. The ingestion of numerous articles is liable to induce urticaria, one article being more certain to occasion it than another, in those predisposed to it. Mussels, cockles, lobsters, crabs, shrimps; the roe of a fish; dried, smoked, and salt fish; dried, smoked, and preserved meats; mushrooms, nuts, and kernels of fruits (see Art. Poisons, §§ 434. *et seq.*); cucumbers, and unripe or stale fruits; some kinds of honey, preserves; oatmeal, especially when long kept; certain medicines, as the balsams, resins, &c., and many other articles, according to particular idiosyncrasies, often occasion this eruption. I have seen it caused by fresh pork. Some persons are so susceptible as to become affected by it after slight friction. J. Frank states that it is rare in Italy and frequent in Russia. This is to be attributed

chiefly to the general use of olive oil in the former, and of animal oils and rancid substances, and dried meats and fish in the latter country. Nettlerash is most common in summer, especially in women, and persons of a nervous and sanguineous temperament; and is much more frequent in children, the young, and adults, than in the aged. Cold, or rather exposure to the air, appears to have considerable influence on the development of the wheals of urticaria, especially in respect of certain parts of the surface which are usually covered.

10. iii. DIAGNOSIS.—It should not be overlooked that the leaves of the urtica urens, urtica dioica, and rhus toxicodendron, the bite of the common bug, of the gnat, of the flea, and the hairs of certain caterpillars, may occasion an eruption of wheals which, although evanescent, may at first, if the cause be not inquired after, be mistaken for urticaria. The white and raised wheals surrounded by areolæ, characterising *urticaria*, differ from patches of *erythema* in these respects, and in stinging, pricking, and itching. *Erythema nodosum* is distinguished from *urticaria tuberosa* by the persistent nature of the former, and the intermitting course of the latter. *Roseola* cannot be confounded with the wheals of urticaria, as it presents red spots and patches, and not the dull white spots of urticaria, and is not attended by pruritus, and the pricking or stinging of this latter. The history and all the phenomena of the case will prevent the eruption from being, at any time during its course, mistaken for either *measles* or *scarlatina*. The papulæ of *Lichen Urticatus* are much more likely to be mistaken for urticaria; but they are less extensive and less prominent than the spots of urticaria; their colour is deeper, they are harder, and they never disappear spontaneously. The bites of insects already mentioned, although causing wheals and itchings, cannot be mistaken for any form of urticaria.

11. iv. PROGNOSIS.—This eruption has appeared as a salutary crisis in some instances of internal inflammatory disease, as remarked by KOCH, RAYER, and others. Whilst, on the other hand, the sudden disappearance of urticaria has been followed by the development or the increased activity of some internal disease. This has very probably been owing to the occurrence or progress of the latter causing the subsidence of the urticaria, rather than to the suppression of this eruption. No one of the forms of urticaria is attended by any danger, although the chronic states are often accompanied with much distress, and frequently resist the most appropriate treatment for a long time. The acute forms, following the ingestion of poisonous articles, however severe, or even when fatal, cannot have the unfavourable results imputed to the eruption, inasmuch as these results proceed from other changes produced by these causes, the eruption being the least important of their effects.

12. v. TREATMENT. — When acute urticaria is produced by the ingestion of poisonous substances, or by articles which are injurious from the idiosyncrasy of the patient, emetics and the other means advised when treating of those poisonous articles which usually cause this eruption, are required (see Art. POISONS, §§ 443. 450.). After the stomach and bowels have been evacuated, liquor ammoniæ acetatis and nitrate of potash may be given in the camphor mixture, or in any demulcent infusion or decoction; or the hydrochlorate of ammonia in similar vehicles. Subsequently a warm bath may be resorted to and repeated, and the bowels kept open by means of cooling aperients. I have found olive oil, taken in frequent doses on the surface of mint water, and the application of this oil to the surface, either before or after a warm bath, of very great service. In full and robust habits of body, or in the young and strong, especially if visceral congestion be present, vascular depletions, in form and amount according to the circumstances of the case, should be early prescribed, a strict diet and regimen enforced, and in all cases a free state of the bowels, by means of cooling aperients, and emollient and demulcent decoctions, be preserved. The insomnia and restlessness so generally observed in the severer cases of this eruption require opiates, but they should be conjoined with cooling diaphoretics and alkalies. I have found James' powder, or the antimonial powder, with the compound soap-pill, or the compound ipecacuanha powder, or a full dose of the carbonates of the fixed alkalies, or of magnesia, in a demulcent infusion, very successful in mitigating these symptoms, especially when either of these means has been resorted to after due evacuation of the bowels, and when taken early in the night, or rather in the evening. If febrile action be present, saline aperients, the acetate or citrate of potash or soda, with nitrate of potash, and spirits of nitric æther, in mint-water, or in camphor mixture; or the citrate of magnesia, in doses sufficient to act on the bowels, will be found of great service.

13. The chronic states of urticaria are often most difficult to remove; and more especially as they are generally caused by errors in diet, and perpetuated by the use of articles which either disorder the digestive organs, or impair the depurating functions, or otherwise affect the circulating fluids, so as to irritate the capillary vessels of the skin. In these cases patients should adopt a restricted diet and regimen, and avoid spirituous, vinous, and fermented liquors, all kinds of shell-fish, and live entirely on farinaceous and vegetable food. I have seen the most obstinate cases, which had been treated by the too generally prescribed preparations of arsenic, iodine, &c., in large and improperly combined doses, yield to the use, chiefly or entirely, of farinaceous and vegetable diet, and distilled water; the secretions, excretions, and depurating functions generally being duly promoted by gentle cooling aperients, such as those mentioned above.

14. When the chronic states of urticaria assume a remittent or intermittent form, and if they do not readily yield to the means already advised, then the preparations of cinchona may be given with the carbonates of the fixed alkalies, or with the solution of the acetate of ammonia, or with the addition of the nitrate of potash; and warm alkaline baths, or vapour baths, be resorted to. External applications, especially those which are oily or greasy, should be avoided, excepting the olive and almond oils, to which the hydrocyanic acid may be added when the stinging and pricking are distressing. But even these should be washed off in a few hours, before they are made rancid by the air and the cutaneous exhalation.

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UTERUS. — Some of the diseases of the *uterine organs* have been considered in the articles on the OVARIA and their diseases, on MENSTRUATION and its disorders, on DROPSIES of the ovarium, uterus, and Fallopian tubes, on LEUCORRHŒA, and on the diseases of the VAGINA and VULVA. Certain uterine maladies have also been fully described with reference to the puerperal states, when treating of PUERPERAL DISEASES. It now remains for me to view those morbid conditions of the uterus which are not noticed under other heads, and which appear to be of such importance as to require attention.

I. MORBID SENSIBILITY OF THE UTERUS. — SYNON.: — *Hysteralgia* (from ὕστερα, the womb, and ἄλγος, pain); *Metralgia*; *Uteralgia*; *Hysteradynia*. Ὑστεραλγὴς, Hippocrates. *Neuralgie de l'Uterus*, *Métralgie*, Fr. *Der Gebärmutterschmerz*, Ger. *Neuralgia of the uterus*. *Irritable uterus*.

CLASSIF. — I. CLASS; V. ORDER. (See *Preface*.)

1. DEFIN. — *Pain of the uterus, generally very severe, sometimes continued, at other times remittent or intermittent, particularly of the neck of the organ; occurring generally at a mature age, but seldom after the cessation of the catamenia; and not necessarily depending upon very manifest organic disease, although more or less inflammation and alteration of structure frequently exists.*

2. *Morbid sensibility* of the uterus occurs, according to my observation, in two forms; — 1st, in that which has been denominated *irritable uterus*, when indications of a slow, chronic, and often most protracted state of irritation, amounting in some cases to inflammation and its usual consequences, are present in the os and cervix uteri; and, 2nd, in that which is more *neuralgic*, where these indications are not manifest, and where the nervous characters of intermission, &c. are most evident. An approximation of the characters of the one affection to those of the other may, however, be remarked in some instances.

3. i. IRRITABLE UTERUS, or *irritability of the uterus*, was first fully described by Dr. GOOCH. The notices taken of it in the works of RIEDLIN, POUTEAU, RIVERIUS, STOLL, and some others, are extremely unsatisfactory, and even calculated to mislead, it having generally been referred by them to rheumatism or gout affecting the womb. Since the publication of Dr. GOOCH's observations on this affection, Prof. DEWEES has directed attention to it; and the more recent writers on the complaints of females have further illustrated this subject, and shown its connection with chronic inflammatory irritation.

4. Irritable uterus is seldom met with before twenty-three years of age, and as seldom after the menstrual epoch has ceased. Dr. GOOCH says that it is not attended by change of structure, and that it does not tend to such change, whilst Dr. DEWEES states that he has usually found some change about the neck of the uterus. In the cases of this affection for which I have been consulted, some have been unattended by any manifest alteration of structure, and others have been accompanied by indications of chronic inflammation of the cervix and os uteri. (§§ 21. *et seq.*) In a case in my own family, no alteration could be detected for a very long time, but a change of structure subsequently became manifest, and assumed a malignant form.

5. ii. SYMPTOMS. — *A.* The *constitutional symptoms* are, increased frequency of pulse on the slightest emotion or exertion; sometimes flushes, alternating with chilliness, previously to the exacerbations; pain in the lowest part of the abdomen along the brim of the pelvis, and often also in the loins, exacerbated by exercise, whilst it is diminished, although not removed, by perfect quietude and the horizontal posture; the pain sometimes recurs in paroxysms, even when the patient reclines, or is quite still, and is generally increased for a few days either before, or immediately after, menstruation; emaciation, paleness, weakness, and increased sensibility and irritability of the whole frame; an irregular state of the bowels, with difficult or painful micturition, and a pale, white tongue, particularly in the morning. Sometimes the pulse is soft, at other times firmer than usual; and although generally somewhat quickened, it is occasionally not above the usual frequency. The skin is commonly dry, and its temperature sometimes augmented, whilst the hands, legs, and feet, particularly the latter, are cold. The febrile exacerbations seldom terminate in perspiration. The patient occasionally complains of headache, which is often increased towards night. The appetite is usually impaired or capricious; and the bowels either are confined, or much relaxed — most frequently the former, the latter more particularly when acted on by purgatives, which generally excite a paroxysm of pain. The urine is either sparing, high-coloured, and depositing a copious sediment; or it is pale, copious, and limpid, particularly when the affection is complicated with hysteria or neuralgic pains in other parts of the body: it is generally voided with difficulty and pain referred to the urethra; sometimes it is retained for a long period, and passed with great suffering.

6. *B. The local symptoms.* — If the uterus be examined, it will be found exquisitely tender, particularly its orifice and neck, the former generally being neither misshapen, nor indurated, although frequently somewhat swollen — a state in which the cervix often also participates. When the pain is excited by an examination, or by coitus, which is also very painful, it does not readily subside;

and it is often induced by the patient seating herself suddenly upon a hard chair or bench, and usually by the sexual congress. In addition to these she frequently complains of a throbbing or fluttering sensation in the pelvic cavity and vagina. Walking, riding, or any exercise increases the symptoms, and causes severe lancinating pains through the pelvic cavity, particularly in the course of the urethra, and about the centre of the sacrum: as these subside, a dull, diffused pain is felt in the same direction. Leucorrhœa frequently accompanies this affection, and often becomes abundant, the discharge varying from a thin transparent and inodorous matter to a thick, muco-purulent, and offensive fluid. There is often increased heat of the vagina. The uterus is occasionally found lower in the vagina than natural, and its neck is generally shortened and enlarged, and sensible to the touch. Pain is felt immediately behind the mons veneris and anterior part of the brim of the pelvis. The catamenia are at first but little affected in this complaint, but they ultimately become more and more scanty, whilst the sufferings of the patient are generally increased at their accession. They often prematurely cease, the patient being reduced by the protracted disease and by the confinement.

7. ii. NEURALGIA UTERI, or *uterine neuralgia*, has been considered a distinct disorder by some writers, and a modification of irritable uterus by others. (See NEURALGIC DISORDERS, § 43.) In this form of altered sensibility of the uterus, the pain is most exquisite, is generally referred to the body of the organ, does not continue for a very long time, and subsides entirely, or nearly entirely. It is altogether paroxysmal, and sometimes almost periodic. The general or constitutional symptoms are less evident, or altogether absent in this affection; but the debility and exhaustion may be greater. Examination per vaginam does not excite the pain in the intervals, although it may aggravate it in the paroxysm: and neither heat, nor leucorrhœal discharge, is usually present. This form of complaint is not commonly — or it is rarely — induced or aggravated by the causes which occasion or increase the sufferings in irritable uterus. The chief features of the neuralgic disorder are the extreme violence of pain during the paroxysm, and the complete or nearly complete subsidence of it during the intervals. Cases, however, occur in which the symptoms of the one form of disorder appear to lapse into those of the other.

8. C. The *diagnosis* of morbid sensibility of the uterus is manifest in the severity of the pain, and in the localisation of it in the *cervix* and *os uteri*, especially of the *irritable form* of disorder, these parts evincing the utmost tenderness on examination, and the existence of great irritation, and ultimately of chronic inflammation and its consequences, namely excoriation, leucorrhœal discharge, &c. The *neuralgic form* of disorder, as well as the irritable form, is unattended by any manifest change of the body of the womb, the symptoms of metritis or inflammation of the body of the uterus (§§ 53. *et seq.*) also being absent. Although both affections are independent of displacement of the uterus, yet they may be accompanied with displacements in one or other form. They cannot be mistaken for dysmenorrhœa or painful menstruation, for they may be present during the intervals between the menstrual periods, although they may be aggravated by the accession of these periods. On vaginal examination of cases of these complaints, the uterus is usually found in its natural position, excepting that it is sometimes situated lower down in the pelvis, or otherwise more or less displaced. In recent cases it is free from organic change, beyond slight tumefaction or fulness, and occasionally softness of its mouth and neck; but in protracted cases, the changes produced by continued irritation and consecutive chronic inflammation usually supervene.

9. *D.* The *prognosis* of the above states of morbid sensibility of the uterus is favourable as regards the life of the patient, although it is not so favourable as respects a quick recovery. It may, if the causes continue to operate, be followed, after some years, by organic change, or even by malignant disease of the os and cervix uteri. Whilst most of these cases will recover, if judiciously treated, some can only be relieved, and others may continue to suffer for many years, especially if the secret habits or vices in which the malady has originated, be persisted in. The issue of these cases will depend much on the causes inducing them, on their recurrence, and on the physical and moral conditions of the patient.

10. *E. Causes* —*a.* The *predisposing causes* of these states of morbid sensibility of the uterus, are constitutional sensibility and irritability, the nervous and irritable temperaments, the impulsive and susceptible disposition, a spare habit of body, previous liability to painful, difficult, or scanty menstruation; repeated abortions, and masturbation.—*b.* The *exciting causes* are not accurately ascertained; but they appear to consist chiefly of fatigue, exertion, prolonged walks, or dancing or standing too long, and falls on the hips or back, or succussions of the body, particularly when the uterus is susceptible, or during the catamenia. Riding on horseback or in a carriage, especially if the road be rough, and during the menstrual period, or without duly evacuating the bladder; the use of cold or astringent lotions or injections to stop a profuse lochia or leucorrhœa; exposure to malaria, &c.; sitting on damp or cold stones, earth or iron seats, venereal excesses, and self-pollutions; neglected or protracted leucorrhœa.

11. *F.* The *nature of irritable uterus* was supposed by Dr. GOOCH to be similar to that of painful menstruation, the former being permanent, the latter recurring with the periodic discharge. He further inferred, that it is not inflammatory, because it does not terminate in change of structure; but it may, and often does, terminate in such change. He states that, after repeated examinations, nothing is discovered excepting exquisite tenderness and slight swelling, or rather tension of the cervix and os uteri. He further supposes, that the fact of many cases, after having lasted for years, terminating in entire recovery, is a sufficient proof that it is a disease of function only. Dr. DEWEES contends, that it consists of a chronic inflammation, which he conceives may exist in some instances for an almost indefinite period without any very manifest derangement of structure; and he states besides that he has generally detected in this affection increased heat, and tumefaction as well as pain, which he views with justice as characteristic of chronic inflammation. M. GENEST nearly adopts

nately the worst features of our common nature — the most bitter manifestations of the "*odium medicum*," which is generally the most bitter and unjust against those by whom success is achieved — have been displayed respecting a recourse to those means which are requisite to "exploration," and the existence of those lesions which are to be ascertained chiefly by the exploration in question — namely, by examinations *per vaginam*, by means of the senses of touch and sight. On this subject it is quite unnecessary to remark further, than that the abuse of any particular mode of investigation, or an improper recourse to and employment of it, cannot invalidate the proofs of the great advantages which are derived from its proper and judicious use; and that the evidence and practice of men of character, position, and experience, are not to be impugned or disparaged by others who are not entitled in any point of view to become the censors of their professional brethren.

22. *A. The causes of chronic inflammation* of the neck of the uterus and its consequences are those which have been enumerated as producing the two chief forms of altered sensibility of the organ (§§ 10.), more especially difficult or disordered or arrested menstruation, excessive sexual indulgences, and masturbation; falls on the back or hips, or injuries in the vicinity of the pelvis or peritoneum; difficult and instrumental labours and abortions; the extension of inflammatory irritation to the neck of the uterus from the vulva and vagina; gonorrhœal infection; the foul air ascending open privies; the use of pessaries; displacements of the womb; cachectic habits of body, and neglect of cleanliness. In many cases the cause of disorder is either not manifest or can only be inferred. The disease seldom occurs before puberty, or long after the cessation of the menses. It is most frequently observed from 20 to 50 years of age.

23. *B. Symptoms.* — The existence of inflammation of the neck and mouth of the uterus is evinced by the appearances of the part; by the local signs and symptoms, and by the sympathetic or constitutional phenomena. The appearances of the cervix and os uteri, it might be supposed could not fail of evincing the existence of inflammation of them, more especially since those appearances have been disclosed by the use of the speculum. Even previously to the use of this instrument, this disease might have been detected by the sense of touch and the phenomena resulting from examinations by this sense, and by the secretions and alterations of sensibility attending it. If the appearances constituting inflammation of these parts admitted of doubt, and consequently of discussion — although discussion has not in this instance been always the consequence of either doubt or unbelief — surely the several results of inflammation, more especially tumefaction, excoriation, granulations, ulcerations, &c., need not have been misunderstood nor misrepresented. When treating of LEUCORRHŒA in 1841 (published in 1842), I referred the two most important states of this complaint to "inflammatory irritation of the mucous glands of the os and cervix uteri," and to chronic inflammation of the internal surface of the uterus, and contended that these forms of Leucorrhœa, especially the latter, are not infrequently of a specific inflammatory nature, or gonorrhœal. Of this specific form I have seen several cases, the first of which occurred at the very commencement of my practice (in 1821); the last very recently, the inflammation having extended to the Fallopian tubes. (See Art. LEUCORRHŒA, § 19. *et seq.*)

24. *a.* The *appearances* of the cervix and os uteri vary with the severity and character of the inflammation — with the amount of irritation and congestion preceding and attending it; with the intensity of the morbid action; with its duration and the amount of exudation and secretions accompanying it; with its extension to the internal surface of the cervix; and with alterations of structure which may have already taken place. The earliest appearances are not always observed; for congestion or irritation, of a more or less inflammatory character, may have existed for a longer or shorter time before the complaint had advanced so far as to induce the patient to have medical advice. When the mucous surface of the cervix is simply congested or inflamed, it usually presents a red or livid hue, instead of the pink or pale rose colour of health; it is often dotted with florid papulæ, or with whitish pustulæ, according as its mucous glands are inflamed or distended with a muco-puriform matter. Frequently the surface of the cervix is covered with this matter so as to prevent its exact state to be observed until this secretion is removed. At first the cervix is somewhat swollen or enlarged, but still soft; but with the persistence of the inflammatory action, and with the exudation into the structure of the cervix more or less induration is superadded. At this early period the os and cervix uteri are hotter and more tender or even painful to the touch than in the healthy state; but the amount of tenderness and of pain appears to depend more upon the temperament and susceptibility of the patient than upon the severity of the inflammatory action — or rather upon the irritable character of this action; the pain being in some cases, both in this stage and throughout the disease, such as to constitute the irritable uterus of several writers as noticed above (§§ 3. *et seq.*).

25. *b.* As the disease becomes more chronic or protracted, the cervix becomes somewhat elongated, and approaches nearer or almost lies upon the posterior part of the vagina. At the same time the os uteri is more open than natural, owing, in some cases, to the congestion, inflammation, or enlargement of the muciparous glands at the orifice and internal canal of the neck, externally to the os internum of the uterus, and in others to congestion of its internal mucous surface and subjacent tissues. This inflammatory state of the mouth and canal of the cervix was shown when treating of LEUCORRHŒA (in 1841) to be a frequent cause and form of that complaint, as it is an associated condition of chronic inflammation of the cervix; and it usually presents a dark reddish or livid hue. The muco-puriform matter secreted by the inflamed mucous surfaces of the cervix varies much in appearance and quantity in different cases; but the chief part of this secretion, as I have stated in the article just referred to (§ 19. *et seq.*), manifestly proceeds from the cervical canal. The state and character of this secretion, especially upon its discharge, depend much upon the time of its retention in the vagina and upon the exclusion or access of air.

26. *c.* Inflammation in the neck of the uterus may continue a long time without giving rise to its usual results. This may be owing to the partial resolution it may experience from the exudation or secretion from its surface and from the mucous glands, or from the menstrual flux. But after an indefinite time, the mucous membrane of the cervix and os uteri, more especially that portion immediately surrounding the mouth of the cervical canal, undergoes further change, generally commencing with excoriations or abrasions of the surface and passing on to ulcerations, but very rarely with loss of substance. These may present minute red granulations, or vegetations of a livid hue. When an abrasion or excoriation is alone present, the surface is generally of a vivid red, and the granulations on its surface are very minute; this state of the lesion occurs chiefly within the mouth and canal of the cervix, and most frequently in single females. In a more decided form of ulceration, the granulations of the ulcerated surface may be firm, of a vivid red hue, scarcely bleeding on pressure, or they may be large, fungous, livid, and bleeding readily on a slight touch. Sometimes the granulations or vegetations on the inflammatory sore rise above the level of the surrounding parts, bleed profusely when they are touched, or even separate partially. Inflammatory ulceration of the cervix is rarely or never excavated; it is always on a level with or above the non-ulcerated tissues, and its margin never presents any abrupt induration. Hence the difficulty of determining its existence and limits by the touch, and the source of differences of opinion as to the existence of ulceration of this part. The cervix very seldom presents more than one ulceration situated around the mouth, dipping into its cavity, and extending more or less on the outer surface. If the ulcerated state consist of several patches, it may be referred to aphthous or ulcerated mucous follicles.

27. The form of the os uteri is generally changed, owing to the existence of the ulcerated state now described both within and around this part. The lips of the os swell, enlarge, expand, and open the cervical canal. This opening varies with the amount of inflammation and of the changes above described, but it is generally greatest in females who have had several children. When with these changes the lips of the os uteri are much hypertrophied and indurated, the opening may admit the first phalanx of one or even of two fingers; and it may then assume the form of two segments of a sphere, separated by a deep fissure, within which the ulcerated surface is situated.

28. Ulceration, or the changes now described as constituting the ulcerative state of the cervix and os uteri, gives to the surface of these parts a soft, velvety character, when examined by the touch. This sensation and the open state of the os uteri are the chief indications which this sense can furnish of the existence of this lesion; but, as inflammation alone will open the cervical canal, and as the velvety sensation cannot be depended upon, the existence of ulceration can only be determined by an instrumental examination. The state of the parts, detected by touch and the symptoms about to be noticed, warrant a resource to this examination. "In nearly all the cases in which ulceration occupies the exterior of the cervix, it will also be found, on examination, to penetrate more or less deeply into its cavity. The entire canal of the cervix, as far as the os internum, may be ulcerated. Even when the cervical canal is free from ulceration, if ulceration exists externally, it is generally inflamed to a greater or less depth." The natural coarctation of the os internum appears generally to constitute a barrier to the extension of ulceration into the cavity of the uterus. But to this rule there are exceptions, as respects the inflammatory state, which obviously extends in many instances.

29. *d. The discharges from the vagina* caused by chronic inflammation of the cervix uteri are identical with those which are described under the head of LEUCORRHŒA. For, as I described these, in that article, as resulting from inflammatory action, as evinced by the local and general symptoms (see § 19. *et seq.*), their connection with the changes above described and disclosed by the speculum is obvious. The discharge generally consists of varying proportions of mucus and pus, it is rarely the latter only or chiefly, unless the inflammation be specific or gonorrhœal. It is not infrequently tinged with blood, especially after violent exertion or sexual intercourse. In these circumstances, the blood is exuded from the ulcerated or granular surface and is seldom in considerable quantity — when in quantity it may be unmixed with the muco-puriform discharge.

30. *e. Hypertrophy* of the neck of the uterus is generally a consequence of chronic inflammatory action, congestion and swelling of this part being an early result. It may, however, remain long without further change; its structure retaining its softness and elasticity. After a time, the exudation of plastic lymph in the interstices of its structure either is considerable, or becomes partially organised, and renders it both hypertrophied and indurated. At first, the inflammatory action is often acute, as indicated by increased heat, vivid redness, and tenderness on pressure; but these signs subside, the hypertrophy advancing with more chronic indications; and sometimes so far as to very greatly increase the size of the cervix. In virgins and women who have not had children, the cervix seldom enlarges to any great extent. It may be indurated and yet not increased in size: but when it is enlarged in this class of patients it seldom is more than two or three times the natural size. In women who have borne children the hypertrophy of the cervix with induration may, according to Dr. J. HENRY BENNET, in extreme cases reach the size of the fist. Some French writers ascribe the ulcerations existing in these cases to the hypertrophy; but he justly contends that the ulceration may commence as early as the hypertrophy and advance with it; and he has seen ulceration confined to one lip, accompanied with induration and hypertrophy of that lip only. When the chronic inflammation causing these changes in the cervix has followed a miscarriage or delivery, the hypertrophy is generally the more remarkable. Hypertrophy and induration are commonly confined to the cervix, but sometimes they extend to the body of the uterus, indicating that it is also the seat of chronic inflammation.

31. As the indurated cervix enlarges, the external opening expands and assumes a transverse form; so that instead of a nearly circular orifice, there is a deep fissure with well-defined lips.

This occurs more especially when the induration is attended by ulceration. Sometimes one of these lips may be many times larger than the other. When the superior lip is much enlarged it covers the os uteri, which is underneath it: when the inferior one is thus changed the os is above it. Dr. H. BENNET says that he has seen both the superior and the inferior lips separately enlarged to such an extent as to form a kind of tumour projecting a couple of inches beyond the non-hypertrophied lip. He states that the hypertrophied cervix is sometimes divided into separate lobes, owing to antecedent laceration of the cervix during an abortion or instrumental labour. The laceration not healing, the ulceration in the course of time is followed by hypertrophy of the segments into which the cervix is divided. These segments sometimes assume a stony hardness; and they may be mistaken for scirrhus; but may be distinguished from that malady as follows: — "When the lobular, knotty irregular condition of the cervix is the result of laceration, and is simply inflammatory, the fissures which separate the lobes radiate round the cavity of the os as a centre, — which is not the case in a cancerous tumour, — each separate lobe being perfectly smooth in itself, and free from tubercles, or superficial irregularities. Not only is this lobular form of induration erroneously considered cancerous, but even the hard inflammatory hypertrophy is still more erroneously considered to be frequently malignant."

32. *f. Displacement* is often consequent upon inflammatory hypertrophy of the cervix; the entire organ generally descends, and the cervix is thus brought nearer the vulva, and at the same time directed backwards. The retroversion of the neck of the uterus is commonly met with in married females suffering from inflammatory induration. With them it is chiefly owing to intercourse; and generally becomes permanent. Enlargement and induration, when very considerable, often occasion more or less prolapsus, unless the vagina be very contractile. In women who have had many children, and in whom the vagina is lax, and offers an insufficient support to the uterus, the prolapse may be so great, especially when standing, as to reach the vulva, or even to appear externally. When the cervix thus lies low in the vagina, a sensation of weight, dragging, and bearing down is experienced, especially when erect. This sensation is caused by the traction of the organ on its ligaments and organs with which it is connected, and by the pressure of the cervix on the vagina and vulva. The hypertrophied cervix may be directed anteriorly, or behind the pubis, and be more or less high. This position is generally owing to some enlargement of the body of the uterus, causing the organ to fall back into the cavity of the sacrum, thus throwing up the cervix. The enlarged cervix occasionally lies diagonally, or to either side, but this position seldom amounts to a diseased condition.

33. *g. Pain* is not always experienced in chronic inflammation of the neck of the uterus, and when it is felt, the situation of it is very often such as not to designate the seat of disease. In some cases pain is almost or entirely absent, although there may be leucorrhœal discharge, and considerable constitutional disturbance, even with slight feverish symptoms towards evening. My experience enables me to vouch for the accuracy of Dr. J. H. BENNET's remarks respecting the seat of pain; for in several cases to which I have been called, an examination has confirmed the connection of the pain with the local affection. The pain is dull, aching, constant, and generally circumscribed, usually felt in one or both the ovarian regions, but much more frequently in the left than in the right; pain of a similar character is also often experienced in the back; and even still more frequently, according to my experience, in the lower region of the sacrum, just above the os cocygis. When it is felt in this situation the neck of the uterus will be found low in, and pressing upon the posterior walls of, the vagina. Sometimes the pain in the back is scarcely perceptible, or is described only as a "weakness," excepting after fatigue, when it is usually more severe. The patient says that her back is broken, and that she can neither stand, sit, nor walk with comfort. "When there is pain in the region of the uterine neck, it is experienced behind and above the pubis. It is seldom circumscribed, like the ovarian pain, but radiates all over the lower hypogastric region. These three pains — the lumbo-sacral, the ovarian, and the lower hypogastric (I name them in the order of their relative frequency), may exist conjointly or separately. They are produced alike by inflammation without ulceration, and by inflammation with ulceration. They are, however, much more marked when there is ulceration, more frequently severe, and much more constant."

34. These pains are not to be mistaken for *neuralgia* of the uterus, which is much more acute, comes on suddenly after intervals, and ceases as suddenly, and is seated in the uterus itself. (§§ 14. *et seq.*) The neuralgic pain is sometimes present only for an hour or two, and rarely longer than ten or twelve hours, the intervals being characterised by freedom from pain. It is sometimes symptomatic of organic disease of the womb, as fibrous tumours in the structure of the organ. But it is often felt independently of any evident lesion, the os and cervix uteri being healthy and free from any morbid sensibility.

35. In addition to the pains described, the patient sometimes complains of pain in the hip, round the crista of the ilium, in the groin, and down the thigh; posteriorly along the course of the sciatic nerve and its divisions; and anteriorly and internally along the course of the anterior crural and obturator nerves. These pains I have referred rather to chronic inflammation of the inner surface of the uterus and enlargement of the organ than to chronic inflammation of the cervix. In the former case they may be caused by deficient support of the vagina, partial prolapse and pressure; in the latter case, they may be sympathetic. The pains caused by diseases of the uterus are always increased by standing, sitting, walking, and exertion, but relieved by reclining and the horizontal posture.

36. *h. The functions of the uterus* are often interfered with during the continuance of chronic inflammation of the cervix. As respects *menstruation*, it may be stated, that it may, for a time, go on without any marked change. But it usually becomes more painful, very scanty, or excessively abundant, and irregular as to the interval, the

duration, and the quantity. The pains, especially on its accession of this period, are greatly increased in the situations above described, and are often attended by retchings and vomiting, by recurring uterine tormina, and by marked tenderness of the hypogastric region. The irritation, congestion, enlargement, and other lesions of the cervix become aggravated during this period.

37. This disease must necessarily be a cause of sterility, in many instances; the morbid states of the cervix and os, and the discharges from them, interfering more or less with impregnation, not only in recently married females, but also in women who have borne children. Some females, however, become pregnant notwithstanding the existence of extensive disease of these parts; but when it takes place under these circumstances, it is generally painful, and apt to terminate in abortion. Sterility proceeding from this disease may be removed by curing its cause. Dr. Bennet states that he is continually seeing patients, who have ceased child-bearing for years, owing to inflammatory disease of the cervix, recover the power of conception when the local affection is cured. Sometimes they become pregnant even before they are quite well, in which case they seldom miscarry, even if the treatment is suspended, although the pregnancy is often laborious.

38. *i. Uterine inactivity*, or exhaustion, is often a symptom of chronic inflammation of the os and cervix uteri, especially when attended by profuse leucorrhœa and ulceration or granulations, or when the disease is severe. Dr. J. H. Bennet remarks that this absence of natural sensations, or sexual desire, sometimes exists independently of any physical pain, and occasions great unhappiness in married life. He attributes this change to the modified vitality of the diseased uterine organs, and impaired general health. The cases of this description, which I have met with, have been chiefly those in which there was reason to believe that the complaint had been caused by self-pollutions, and where the tenderness of the os uteri and adjoining parts rendered sexual congress more or less painful; for instances are not rare of masturbation being persisted in, although marital congress is resisted or evaded. When the cervix is so tender from this disease as to render congress painful, the sensation is experienced at the time, and for some hours afterwards, or even longer. It may be felt either behind the pubis, or in its usual situations. But, although the disease may be severe, the cervix being ulcerated and enlarged, congress may not be painful. Whether painful or not painful — the former especially — this act may be followed by a discharge of a little blood, or even by considerable hæmorrhage. That the evasion of marital congress is owing rather to the circumstance just adverted to, than to the disease of the cervix, is evinced by the fact that such evasion is not manifested in other diseases of the uterus, or very rarely.

39. *k. Constitutional and general symptoms* are always present when the cervix uteri is diseased. It should not be overlooked that this part of the uterus possesses marked sensibility and intimate relations with all parts of the œconomy, through the medium chiefly of the ganglial and sympathetic system. Hence the digestive functions are more or less disordered according to the duration and severity of the local complaint; and there are frequently both nausea and vomiting on the accession of the catamenia. The disorder of the stomach and digestive organs is often somewhat similar to that consequent on early pregnancy, and is the consequence of the inflammation. The leucorrhœa so generally present has been too often imputed to this disorder of the digestive organs, instead of these complaints being regarded as results of the inflammation of the cervix. The urinary function is often more or less disturbed, in respect both of the saline constituents of the urine, and of the frequency of the calls to discharge this secretion and the sensations attending the act. Dysuria is sometimes complained of, and a portion of the secretion from the inflamed cervix often passes from the vagina at the time of micturition.

40. The *pulse* is sometimes very materially affected, and becomes more or less accelerated towards evening; and as debility increases, it is generally weak, or small and irregular, and readily accelerated on any mental or physical excitement. A protracted state of the disease, especially when characterised by granulation, ulceration, and abundant leucorrhœal discharge, ultimately occasions anæmia, pallor, a sickly or sallow appearance of the countenance, loss of flesh, and a flabby state of the muscular structure. Contingent upon the course of the disease, various sympathetic affections often appear, especially nervous headache, depression of mind, a sense of weight or pressure at the summit of the head or on the forehead, pain and tenderness in the course of the spine, and numerous hysterical symptoms. These phenomena are generally exacerbated during the catamenial period, especially when this period is disordered in any way. Most of the symptoms described in the articles Hysteria and Spinal Irritation originate in this disease of the cervix and os uteri.

41. Dr. J. Henry Bennet was the first who gave full accounts of the diseases of the cervix of the uterus; and he was followed by Dr. Whitehead of Manchester, Professor Simpson of Edinburgh, and Professor Miller of Louisville, U. S. Various other writers on uterine disease have coquetted with the subject, and, after having endeavoured to controvert the statements of these physicians, have at last fallen in with their views. From these and other sources of information, furnished not only in this country, but even much more abundantly on the continent, as will be seen in the Bibliography, the great importance of inflammatory disease of the cervix uteri is made apparent. Dr. Whitehead has given an enumeration of the lesions of this part of the uterus; and, although I do not profess this or any other speciality, but endeavour to practise as a physician in all medical cases, yet I am sometimes consulted respecting uterine diseases; and I am thus enabled from some experience to say that the statements and descriptions furnished by the physicians whom I have mentioned, are unassailable.

42. "1st, Inflammation and superficial erosion, implicating one or both lips of the os uteri, and more or less of the external and internal cervix; — 2d, Varicose ulceration, commonly occupying the back part of the anterior lip, sometimes confined to the posterior, and occasionally implicating both. It gives rise to hæmorrhages obeying, more or less perfectly, the menstrual periods,

and to purulent discharges in the intervals;—3d, Œdema of the cervix;—4th, Fissured ulceration of one or both commissures, of the anterior or posterior lip, or implicating all these parts at the same time; — 5th, Induration of the cervix, with or without abrasion of surface; — 6th, Endo-uteritis, or inflammation of the lining membrane of the uterus, affecting the body as well as the neck, and sometimes accompanied with induration of the cervix, or erosion of one or both lips of the os uteri;—7th, Follicular ulceration;—8th, Gonorrhœal inflammation, affecting the lips and adjacent cervix, and especially liable to spread to the lining membrane of the entire organ; — 9th, Syphilitic disease, in its primary, secondary, and tertiary stages; — 10th, Prolapsus uteri, which owes most commonly its existence to disease of the lower part of the uterus, as the primary exciting condition."

43. To this enumeration of lesions, given by Dr. Whitehead, may be added *hypertrophy*, with or without ulceration, or granulation, or dilatation of the cervical canal. This, in one or other of these states, is a frequent consequence of chronic inflammation of the cervix. *Gonorrhœal inflammation* of the cervix and its canal is of greater importance than is usually considered. I have seen several instances of this form of disease; and in nearly all it extended to the lining membrane of the uterus, and was accompanied with great suffering. In three cases of married ladies, not only did this extension occur, but the *ovaria* also became remarkably enlarged. Recovery ultimately took place; but the ovaria remained more or less enlarged in all.

44. *C. In the virgin and unmarried female*, inflammation and its consequences noticed above are by no means infrequent; and, although partially described by me in the article Leucorrhœa in the section on "*Leucorrhœa from inflammatory irritation of the mucous glands of the os and cervix uteri*" (§§ 19. *et seq.*) before the appearance of Dr. Henry Bennet's work, yet to him the distinction is justly due of having first fully described and elucidated this subject in respect of this class of patients; and I can fully corroborate his statement that inflammation and ulceration of the cervix uteri in the virgin is not an uncommon disease, and that to it may be referred most of the severe forms of dysmenorrhœa and leucorrhœa which resist the ordinary modes of treatment. Even within these few months I have been called to several cases, under the care of other practitioners, where this disease existed, from ages varying from nineteen to thirty. Scanty, excessive, and irregular menstruation, as well as the complaints just mentioned, not infrequently proceed from inflammatory states of the cervix, and internal surface of the uterus, as shown in the article on Menstruation. (See more especially §§ 85—129.)

45. The *causes* of inflammation of the cervix uteri in unmarried females have been already noticed. (§§ 10. 22.) The *symptoms* in them are not materially different from those already described: the permanency of a leucorrhœal discharge; the local pains; dysmenorrhœa, and otherwise disordered menstruation; spinal irritation; sympathetic pains in the hips, thighs, spine, and under the left mamma; bearing down, weight in the pelvis, debility, pallor, anæmia, emaciation, &c. In addition to these, *partial prolapse* of the uterus, and other *deviations* of its position, are not infrequent in this class of patients.

46. *D. During pregnancy* inflammation and ulceration of the os and cervix uteri may be present, having existed previously, or supervened subsequently to impregnation. MM. Boys de Loury and Costilhes first noticed this state of the disease; and soon afterwards Dr. Henry Bennet, in 1846, and Dr. Whitehead, in 1847, fully illustrated this association of inflammation of the cervix uteri. Dr. Bennet remarks that he formerly believed that the disease mostly originated subsequently to conception. This opinion, however, his later experience on a wider field has shown to be erroneous. Although it sometimes thus originates, the cervix is diseased in the majority of cases previous to conception. He adds that the disease generally produces sterility when it attacks young married females at the onset of their married life, but not so generally arrests conception when they have had children before they are attacked. The *indications* furnished by tactile and ocular examinations in this state of the disease are the same as already described. The disease is attended by pains in the back, sacrum, above and behind the pubes; and by a sense of weight and bearing down, and muco-purulent discharge. As pregnancy advances the pains increase; the sickness and vomitings attending this state become severe; and the muco-puriform discharge is often accompanied with more or less hæmorrhage. Dr. H. Bennet has very satisfactorily shown that this disease in the pregnant state is often a cause of the various disorders complained of in this state, or hæmorrhage, obstinate sickness, death of the fœtus, abortion, moles, &c.; and Dr. Whitehead has fully corroborated this statement. These are most important practical facts; and, however sneered at by some, doubted by others, and disbelieved by a few, I have had occasions, since the date above mentioned, to be convinced of the truth of the statements made by these physicians. I may here adduce a summary of Dr. Whitehead's researches on the influence of the lesions under consideration in producing *abortions*; and in this he confirms what had been previously adduced by Dr. H. Bennet. Inflammatory ulceration was the cause of abortion in 26 in every 100 cases; and this event occurred between the middle of the sixth and the middle of the ninth month of pregnancy. Varicose ulceration induced abortion in 6 or 8 out of every 100; and it operated during the latter two or three months. Œdema of the cervix, acting likewise in advanced pregnancy, was observed in about 1 in 25 or 30 cases. Fissured ulceration was found to exist in 20 to 24 out of every 100 cases, and may cause abortion from the fourth to the middle of the seventh month.

47. *E. During and after abortion and parturition*, inflammation, ulceration, and induration of the neck of the uterus are often productive of much and serious disorder. Induration, enlargement, and rigidity of the os and cervix uteri, in abortion or in labour at the natural period, render these acts both difficult, painful, and prolonged; and these lesions of this portion of the uterus, as well as ulceration, often occasion hæmorrhage after abortions and parturition and this hæmorrhage is frequently followed by profuse, purulent, or muco-purulent discharge. "When the patient first

attempts to rise and walk, she feels a sensation of weight and bearing down, which gradually increases, instead of diminishing. If the hæmorrhage and purulent discharge are continued and abundant, and the uterine pains are very severe, several weeks often elapse before she is able to leave her bed; and when she does, she remains weak, languid, and is unable to make the slightest exertion." Inflammatory ulceration, during the first stage of the puerperal period, powerfully predisposes to puerperal fevers, and to abscess of the ligaments. It is so commonly developed after abortion, Dr. BENNET remarks, that he always looks for it when the patient does not rally, but presents the symptoms already described.

48. *F. In advanced life, and after the cessation of the menses*, inflammation and ulceration of the neck of the uterus are sometimes met with. At this period, especially when the menstrual epoch has long ceased, ulceration is the form which inflammation of this portion of the uterus generally assumes. The most prominent symptoms at this epoch are severe and constant pain in the sacrum and lower part of the back, less severe and less constant pains in the ovarian regions, and in the hypogastrium, leucorrhœal discharge in some cases only, and bearing down and prolapse of the uterus much less frequent and more slight than in younger females. Ulceration of the neck of the uterus, in advanced age, seems to be oftener the remains of inflammatory disease present at the time when the menses ceased, than an affection which had commenced subsequently to that period.

49. ii. INFLAMMATION OF THE BODY OF THE UTERUS IN THE NON-PUERPERAL STATE. — SYNON.: — *Metritis; Hysteritis; Inflammatio Uteri.* — Inflammation of the womb may assume various forms or states. It may be *acute, sub-acute*, or *chronic*; it may be *sthenic*, or *asthenic* or *septic*; it may be *common* or *specific*; and it may affect either the *internal surface*, or the *whole body* of the organ. In the article on PUERPERAL DISEASES I discussed *Inflammations of the Uterus, its Appendages, and Veins* (see §§ 176. *et seq.*) *with reference to the several puerperal conditions*; and I now proceed to consider those forms of inflammation of this organ which I have now mentioned, and as they commonly occur in the non-puerperal state.

50. *A.* INTERNAL METRITIS.—*Endo-Metritis.* — *Non-puerperal Inflammation of the internal surface of the womb*, in its most frequent forms, has been partially considered under the head LEUCORRHŒA (§§ 25. *et seq.*) and MENSTRUATION (§§ 78—129.). I have there shown that inflammatory states of the internal surface of the uterus may occasion certain forms either of leucorrhœa, or of menstruation, varying with the modified states of vascular action, not only in the uterus, but also in the cervical canal; the morbid action being rarely limited to the former, but generally extending to the latter, and often also to the substance of the uterus. Dr. H. BENNET considers that a *sero-sanguinolent* discharge is as characteristic of endo-metritis as the rust-coloured expectoration is of pneumonia. The internal cavity of the uterus in health is not much larger than that of the neck; but it is not improbable that, during the period of menstruation, or when congestion or inflammatory action exists in this part, this cavity may be somewhat enlarged, as, indeed, the whole organ frequently is in these circumstances. If, in addition to the discharge just noticed, there be a dull, deep-seated pain behind and slightly above the pubis, and more or less general febrile reaction, endo-metritis may be confidently inferred. Since, in the introduction of the uterine sound, and its improvement by Professor SIMPSON, a recourse to it has been considered as a means of diagnosis in endo-metritis; for, if the os internum of the cervix be so completely open as to allow the uterine sound to pass freely into the uterine cavity, and if this cavity be increased in size, and be more sensitive, the above symptoms being also present, this complaint is certainly present. But endo-metritis may exist and not be attended by the sero-sanguinolent discharge alluded to. It is only when the inflammation is most severe that it is present. In the less severe and congestive states, it is characterised by the discharges and the symptoms described in the sections on LEUCORRHŒA above referred to, and, during the menstrual periods, by the painful, difficult, inflammatory, or hæmorrhagic symptoms described in the article MENSTRUATION. (See §§ 78—129.)

51. As endo-metritis is commonly attended by chronic inflammation of the cervix and os uteri, the symptoms of the latter are generally present. Nevertheless, the former gives rise to nearly the same symptoms; yet the deep-seated and constant pain behind and partly above the pubis, the sensation of weight and bearing down, the swollen, sensitive, and enlarged conditions of the organ evinced on examination, the states of the discharge and of menstruation already noticed, and the accompanying febrile action, although often slight, but always increased towards night, sufficiently indicate the nature of the disease.

52. The *progress* and *terminations* of endo-metritis depend much upon its causes and the circumstances in which it originated. It is often attended by more or less inflammatory action in the cervical canal, and in the substance of the organ; and, according to the extent of this association, to the occurrence of the disease after difficult or instrumental labours or after abortions, and to the domestic, moral, and hygienic conditions of the patient, the course, duration, and termination of the complaint should be imputed. A *chronic form* of the disease is apt to supervene, especially in the circumstances now alluded to; and even in favourable cases the acute form generally passes into the chronic, the constant discharges from the internal surface and neck of the uterus, whether sanguinolent, serous, muco-puriform or purulent, and the catamenial discharges, whether difficult, scanty, or excessive, or attended by coagula, or by plastic exudations, ultimately tend to reduce the acute into a chronic state of the disease. *Ulceration* of the internal surface of the uterus has been rarely noticed as a consequence of endo-metritis. When this occurs, the cavity of the uterus is considerably enlarged, and contains pus, mucus, and a bloody matter, which are discharged more or less freely, and often at intervals. Dr. HALL DAVIS examined the uterus of a woman which exhibited these appearances, with several large ulcerations in the internal surface.

53. *B.* ACUTE METRITIS, *in the non-puerperal state*, is a rare disease. At the commencement

of my practice (in 1822), having described an undoubted instance of it, at a meeting of a medical society in this city, the case was considered apocryphal. Since then, I have been requested to see other cases, both simple, specific, and complicated, but in most of them the inflammation had commenced in the neck and internal surface of the uterus, or had extended to these parts, and thence to the body of the organ, and in some instances to the uterine appendages. On referring to the notes which I took of the more remarkable cases—since the one in 1822—which I have seen, I find that the disease occurred in seven married females who had never been pregnant, and in three unmarried females. In four cases it was referred to gonorrhœa communicated by their husbands, and in three of those the disease extended to the uterine appendages, the ovaria becoming acutely inflamed and ultimately remarkably enlarged. These four females had never been pregnant. I have notes of the disease as I observed it in six married females who had had children, but who had not been pregnant for a very considerable time previously to their attacks. In two of these last, the cause and course of the disease were so singular as to require a more particular notice in the sequel. Within these few years other cases have been seen by me; and I am at this time seeing in consultation a very acute case of the disease in a single woman. In none of these instances could any doubt be entertained as to the seat of the malady.

54. *a. The seat* of metritis is the whole body of the uterus; but the disease may commence in different ways. It may attack the whole organ primarily, or extend to it from the internal surface or the neck. These parts may themselves be affected consecutively upon inflammation of the vulva and vagina, especially when they are inflamed by specific, or asthenic, or contaminating causes. Inflammation of the body of the uterus, in the non-puerperal state, seldom extends to the peritoneal surface so as to give occasion to either partial or general peritonitis, as so generally observed in puerperal metritis. An instance, however, occurred, to which I was called towards its close, of a lady who had been treated by very astringent injections for the removal of profuse discharge from the internal uterine and cervical surfaces. With the suppression of the discharge, acute metritis supervened, and was very rapidly followed by inflammation of the peritoneum covering the pelvic viscera, and ultimately by death; the progress of the disease being manifested by examination after death. Metritis, in very rare cases, may occur in the non-puerperal state from the extension of inflammation from the rectum or bladder. Many years ago I attended, with Dr. ROBERT LEE, a married lady, who was attacked at first with dysenteric tenesmus, manifestly owing to inflammatory action which had commenced in the rectum and sigmoid flexure of the colon. Soon afterwards unmistakable evidence of acute metritis appeared. This lady had not conceived for several years. Soon after the full developement of the metritis, which was attended by intense suffering, phlegmasia alba dolens of the left thigh began to appear, and when the subsidence of it commenced, the right thigh became similarly affected. She ultimately recovered. But disease may commence almost simultaneously in the rectum and vulva from certain septic emanations, especially in females who have had children. I was called to two families living in the opposite outskirts of London, during a very warm autumn, after a hot summer. The privies of both houses were open, very full, and offensive. Several younger members of these families were attacked by dysentery, with distressing tenesmus, and their mothers became the subjects of both the dysenteric affection and asthenic inflammation of the vulva, rapidly extending to the vagina, and to the neck and body of the uterus. In both these cases the symptoms of acute metritis were unmistakable and most violent, and were, with the dysenteric affection, manifestly caused by the state of the privies, to which, indeed, the patients themselves referred them. I have, both in this and in foreign countries, had frequent reason to impute the occurrence of DYSENTERY (see § 24.) to open privies, &c.; but these two are the only instances I recollect of both dysentery and acute metritis having appeared coëtaneously in the same female.

55. *b. Symptoms.* — The patient complains of severe and constant pain deeply seated in the hypogastric region, chiefly behind and above the pubis, darting into the ovarian regions, around the hips, and sometimes down the thighs, with a sensation of weight and uneasiness in the pelvis, and of severe pain of the lower lumbar, lumbo-dorsal, and sacral regions. Pain on firm pressure is felt just above the pubis, in the median line, and equally to the right and left of that line. On examination, the vagina is generally hot and dry; the cervix and os uteri are swollen and sensitive to the touch or to pressure. The body of the uterus is enlarged, and attempts to ascertain its size are attended by extreme pain, and often by nausea or retchings. The symptoms are always aggravated by sitting down on a hard seat, or by an examination per vaginam, and the patient is unable to walk or stand, or to sit up in bed. She generally lies on her back with her knees drawn partially upwards. Calls to pass urine are frequent, and attended by dysuria. The bowels are usually constipated, and costive motions are passed with extreme pain and difficulty, the hardened fæces being surrounded by much mucus. In many cases violent paroxysms of pain occur after intervals of comparative ease.

56. This acute state of the disease is not often preceded by chills or rigors, and it is at first not attended by any vaginal discharge, unless it have supervened upon vaginitis, or endo-metritis, as in some cases of asthenic or diffusive inflammation of the vagina and vulva. However, when the inflammation has commenced in, or extended to, the inner surface of the uterus (§ 50.), a sero-sanguinolent, or purulent discharge takes place. As the disease subsides, a copious discharge, of various appearances, occurs. In addition to the usual febrile or constitutional symptoms, especially thirst, restlessness, scanty, high-coloured urine, constipation, headache, want of sleep, &c., there are constant nausea; a white or furred tongue; pain and swelling of the mammæ, and sometimes hysterical symptoms, but chiefly in nervous and hysterical females. In less severe cases the symptoms are milder, and the nature of the complaint is evinced chiefly by a careful digital examination.

57. *c. Terminations.* — In from seven to four-

teen days the disease subsides, generally without either suppuration or inflammation of the uterine veins, in the non-puerperal state; but this latter result may occur in this state, as shown in the case attended by Dr. R. LEE and myself (§ 54.), and in two other cases for which I was consulted, and which terminated fatally, the uterine phlebitis having been followed by secondary purulent formations, as shown by examination after death. It is chiefly in the cachectic habit of body in females addicted to intoxicating liquors, as in one of the two cases just now alluded to; and when the causes are of a septic or infecting nature, and the disease assumes an asthenic character, that either the veins become implicated on the one hand, or the peritoneum on the other.

58. Acute metritis may degenerate into the chronic state, and occasion the inflammatory forms of *Leucorrhœa* and of disordered *Menstruation*, (see those Articles), or various consecutive lesions; and it may give rise to purulent collections, either near to, or even in the cavity of the uterus. In either case the collection, as it becomes increased, is evacuated sometimes more or less suddenly, and after a greater or less increase of suffering per vaginam. When matter is formed near the outer surface, it most frequently extends to the cellular tissue between the lateral ligament, and finds its way, as in cases of suppuration occurring in those ligaments.

59. *d. The Prognosis* of acute non-puerperal metritis is generally favourable when the constitution of the patient is sound; when the disease is treated promptly and judiciously, and the causes are not of a contaminating or specific nature, as in the cases above alluded to (§ 54.). In drunken females, in the cachectic, and when the disease has been produced by infectious or contaminating agents, the extension of inflammation to the ovaria, to the veins, or to the peritoneum, should be dreaded; and in either case the patient's life may be placed in the utmost jeopardy. Even if the acute should lapse into the chronic state, or give rise to chronic inflammation of the lateral ligaments, much and prolonged suffering will result.

60. *e. Diagnosis.*—Acute metritis may be mistaken for acute cystitis, or the latter for the former. But a careful examination of the hypogastric region, of the state of parts per vaginam, and of the condition of the urine and the phenomena attending the discharge of it, will readily disclose the organ affected. When the lateral ligaments are inflamed, the pain and tenderness on pressure are experienced on one side of the median line, or in one side of the pelvis; "and the finger passed up towards the uterus, detects the inflammatory tumour lying on one side of the uterus."

61. *f. Examinations after death* from acute metritis in the non-puerperal state are rare, unless death has been caused by uterine phlebitis or by peritonitis, as in the cases alluded to above which occurred in my practice. In these cases, the uterus was considerably enlarged, and very much softened, especially towards its internal surface. The substance of the organ was infiltrated with a dark ichorous fluid, in one case; and with a greenish brown fluid in the other. The cavity of the uterus was much enlarged in both, but much more so in one than in the other, and its surface was covered with a chocolate-coloured or rusty exudation in the one, and by a rusty purulent exudation in the other; this latter containing a little of a softer matter of the same appearance and of an offensive odour. The spermatic veins were inflamed, and contained coagulated blood, phlebitis extending throughout the uterine and spermatic veins to the vena cava, with coagula mixed with an ichorous or sanious purulent matter. In one case purulent collections, more or less of a sanious appearance, and offensive odour, existed in the liver; and in another, matter was formed in one of the eyes, which had burst shortly before death. In a third case above alluded to (§ 57.) peritonitis supervened, the uterus presenting but slight alterations of structure; but the *peritoneum* exhibited the lesions described in the article on this membrane. (See §§ 80. *et seq.*)

62. C. SUB-ACUTE AND CHRONIC METRITIS. — *Sub-acute metritis* is merely a less severe form of the acute, most of the symptoms described above (§§ 53. *et seq.*) being present, but in a slighter degree. The *chronic* form of the disease may, like the acute, vary much in severity; but, unlike it as respects frequency, is a common form in its simple and complicated states. It generally is seated in a part of the body of the uterus; and, in the opinion of Dr. H. BENNET, in nine cases out of ten in the posterior wall of the organ, in its inferior region, adjoining to the base of the cervix. It is commonly the result of extension of chronic inflammation of the cervix, and in some instances of the acute or sub-acute state of the disease. In these instances it may exist either in the anterior wall, or in one of the lateral walls, of the uterus.

63. *a. The symptoms* vary much with the exact *seat* of the disease, and with the periods during or near menstruation. In the intervals between these periods, the patients are comparatively easy; the local symptoms are either much mitigated, or but little complained of; and fever is either slight, or experienced chiefly in the evening or night. In many cases, however, the functions of digestion, assimilation, and nutrition are impaired, and various nervous symptoms are experienced. When the vascular determination preceding menstruation supervenes, then all the symptoms characterising the disease are developed. A constant, dull, aching pain is felt in the lower hypogastric region, behind and a little above the pubis, and in the left or right ovarian regions, most frequently the left. A dull aching pain is also present under the left mamma or in the left hypochondrium, in the lumbar-sacral region, extending around the hips, and down the insides of the thighs; and is often more complained of than the deep-seated pain in the pelvis. Walking, descending a stair, or riding in a carriage, and every kind of motion, are extremely painful, more especially before, during, and after menstruation; and in some cases are then agonising. On the accession of this period, the patient's sufferings are sometimes aggravated by sickness and vomiting.

64. On examination per vaginam, in addition to co-existing disease of the cervix, the seat of disease is easily detected. The finger, when passed to the base of the cervix, and around it, meets with an exceedingly sensitive elevation, in some cases regular, in others irregular, but spherical. Pressure on the tumefied part is very painful. Occasionally there is hardly any per-

ceptible swelling, but exquisite tenderness; pressure giving rise to sickness. The womb is generally movable, but the attempt to move it is attended by pain and nausea. Owing to its mobility, inflammation and enlargement of a portion of the uterus is generally attended by more less displacement of the organ, which falls more or less in the direction of its enlargement. If the posterior wall be the seat of enlargement, as is most commonly the case, the organ falls backwards towards the cavity of the sacrum, and the cervix is turned upwards and towards the pubis; producing *retroversion*; but never in such a manner as to press upon the urethra, as sometimes occurs in retroversion during pregnancy. The cervix, however, may remain in its usual position, and not be anteverted, it forming an angle with the body of the uterus, which is said to be retroflected. If it be the anterior wall which is tumefied, the uterus may fall forwards, especially in married females, and occasion *anteversion*. When retroversion is connected with much enlargement, the uterus presses upon the rectum, and becomes a mechanical obstruction to the process of defæcation. In both forms also of displacement, especially when very marked, considerable disorder of the functions of the urinary bladder results, the calls to urinate being often, difficult, or otherwise affected. Chronic metritis affecting chiefly one of the sides of the uterus, or associated with disease of the appendages of that side, may likewise occasion more or less displacement in that direction; but this is comparatively rare. Chronic metritis may not be necessarily attended by any vaginal discharge; but such discharge is most frequent, owing to the co-existence of inflammation of the cervix and vagina, and is either muco-purulent, or purulent with a more or less sanguineous tinge.

65. *b. The constitutional symptoms* of this disease, especially when protracted, are well-marked, and are, according to my observation, well described by Professor Simpson and Dr. H. Bennet. The countenance is generally pale and sallow, and offers an expression of languor and pain; the "*facies uterina*" being more especially manifested by this malady, and particularly during or near the period of menstruation. Emaciation is a frequent sign, although not always recognised or recognisable at first. Nausea is generally present; in the most severe cases, it is almost constant; in the less severe, only at the accession or during menstruation. Nausea, or sickness with loathing of food, but without vomiting, is so characteristic a symptom of metritis that, when it is present in chronic inflammation of the cervix, the extension of the disease to the body of the uterus may be inferred. Besides the intimate sympathy existing between the stomach and uterus, numerous other sympathetic derangements occur in the course of the disease, more especially palpitations, heartburn, headach, feverishness, want of sleep, restlessness, morbid states of the urine, constipation, dysuria, painful defæcation, &c.

66. *c. The progress and terminations* of chronic metritis are very variable. It is generally present for some time before the symptoms mentioned above are developed. It is at first attended by slight or obscure symptoms, which become more severe about the period of menstruation, and more and more constant with the advance of time, until the patient is prostrated by their severity and continuance. Whilst recurring menstruation, by the vascular determination and congestion characterising it, tends to exacerbate the disease, the vascular discharge, especially when considerable, reduces the severity of it, favouring a partial resolution, and perpetuating the chronic condition, when unaided by judicious treatment. When, with the periodical exacerbations, other causes of developing uterine inflammation are conjoined, the chronic may pass on to the acute form, and, in either form, may be extended to the uterine appendages, or even to the peritoneal surface. Cancerous degeneration of this state can rarely or never occur, unless in the cancerous diathesis. The most common consequences of chronic metritis are those already noticed, namely, displacements, enlargements, and the extension of the disease to adjoining organs or parts.

67. *d. Diagnosis.*—Patients affected with chronic metritis, existing either simply or with chronic inflammation and ulceration of the cervix, but a few years ago, were generally considered as subject only to functional dysmenorrhœa, or to displacements of the uterus. Dr. Henry Bennet referred these latter to chronic metritis, and viewed them when present as consequences of metritis, which, however, might exist without having as yet been followed by these consequences. Whether or no displacements of the womb ever occur without previous inflammation and its consequences, enlargement, &c., becomes a question, and one which requires solution; but there appears no reason to doubt the fact of the latter often producing, and frequently being associated with, the former. However, it should not be overlooked, that, when an enlargement of the uterus is great, when it is not attended by any considerable pain or tenderness on pressure, it very probably arises from the formation of a fibrous tumour in the uterine walls. In these cases, there is generally displacement in the direction of the uterine tumour. When the tumour is large, it is often attended by more or less inflammatory action; and when this obtains, then both pain and tenderness may be expected. "An inflammatory tumour also of the broad ligaments may be mistaken for chronic metritis, occupying the lateral region of the womb, especially if the tumour be lying on the uterus, as is often the case." The symptoms characterising the latter affection will be noticed in the sequel; but both affections are sometimes associated.

68. It may be difficult to distinguish *cancer* of the womb from chronic metritis. If the uterine swelling presents nodosities or irregularities of surface; if the pains are lancinating; if the general health is very much impaired; if the patient is sallow, cachectic, emaciated, anæmied, and weak, well-founded suspicions of cancer may be entertained. It is chiefly from the history of the case, and from the consideration of a variety of circumstances, that a correct diagnosis can be formed. Cancer most frequently commences in the cervix, and extends to the body of the organ. But in both situations it is either latent, or it does not come before the physician until it has made considerable progress. It is then, or it soon becomes, immovable, owing to adhesions between the uterus and surrounding tissues. "In chronic metritis there may be adhesions, but they are not

of the perfectly immovable nature of those observed in the malignant affection. In cancer, the nodosities and inequalities are sharp, knife-backed, irregular; in chronic metritis, they are spherical and regular in their irregularity. Cancerous tissues are seldom very sensitive to the touch, whereas it is the reverse with the inflamed uterus. Cancer has a tendency to progress and to pass through its periods in the course of a limited space of time, say one, two, or three years. The symptoms indicating the existence of chronic metritis, on the contrary, may generally be traced back for several years, and when recognised, the disease appears to remain nearly stationary, if left to itself. The consideration of these differences will also prevent cancer being mistaken for chronic metritis. If cancer of the uterus has become ulcerated, the distinction is still plainer." (*Op. cit.* p. 44.)

69. *D.* Enlargement of the Body of the Uterus.—Hypertrophy or overgrowth of the uterus, more especially of its body, may in many cases be traced back for weeks or months to an abortion, or a severe labour, or to disease after delivery. It may, however, originate independently of any of the puerperal states. But in most circumstances it commences without marked severity, generally with slight ailment only, and even when supervening upon abortion or delivery it manifests merely a state of incomplete convalescence. When inflammation in any form follows either abortion or delivery, the process by which the womb is restored in a few weeks to its condition previously to conception—the *process of Involution*, as termed by Rokitansky and West—is checked. This process takes place in the structure of the uterus, which, having performed its grand function, undergoes a state of degeneration, and a partial conversion into a fatty matter, rendering it more susceptible of being either absorbed or eliminated in the lochia. During the second week after parturition this process is most active; but it proceeds also during the third and even fourth week. The process of reconstruction soon follows, and, according to the German microscopists, cells, nuclei, caudate cells, and the elements of new fibres are formed, and the organ is built up anew. The manner of this reconstruction has not been satisfactorily explained by histologists; but it appears most probable that this renewal goes on *pari passu* with the removal of the old materials. The interior of the uterus undergoes similar changes to those which take place in its substance. "It is not until its lining membrane, with the exception of that of the cervix, has been several times reproduced and then cast off in a state of fatty degeneration, that it resumes the same condition as before impregnation. The occurrence of inflammation appears to interrupt these processes, for, though fatty degeneration of the tissues takes place, yet the removal of the useless material is but imperfectly accomplished, while the elements of the new uterus are themselves, as soon as produced, subjected to the same alteration; and the organ remains, long after all mischief has passed away, increased in size, and at the same time composed of a tissue inapt for all the physiological processes of conception, pregnancy and child-bearing." (West, *Lect.*, p. 92.) This result will follow not only the mild, or chronic, or sub-acute, states of inflammatory action developed in the organ during the process of involution, but even any excitement of the sexual organs occasioning determination of blood to the organ, more especially sexual intercourse too soon after delivery or abortion.

70. *Symptoms, &c.*—Enlargement of the uterus consequent upon *deficient involution* may continue a considerable time without causing more at first than protracted convalescence, and a feeling of local and general ailment; but generally further disorder ensues, often with increased organic lesion. A sense of weight and bearing down; pains deep in the pelvis, back, and sacrum, often extending to the hips and thighs, numbness or pains in the limbs; difficult and painful defæcation, frequent micturition, &c., are usually complained of. After a time various complications of this lesion occur, more especially prolapsus, retroversion, congestion or chronic inflammation, frequent, or difficult or excessive menstruation, &c.

71. *True Hypertrophy*, or enlargement of the uterus independently of defective involution, occurs in both married and unmarried females. Dr. West considers that it is met with in the former chiefly, and remarks that "excessive or intemperate sexual intercourse does not produce it, though that leads to its own train of evils; but there has in many instances seemed good reason for associating the condition with the imperfect performance of that function, and sometimes the evidences of that being the case have been conclusive." There can be no doubt of this being a not infrequent cause; although it is not the only organic lesion consequent upon this cause, ovarian disease being perhaps an equally frequent result. Although true or primary hypertrophy of the uterus may be most frequent in married females, it is by no means rare in the unmarried, especially after twenty-six or twenty-eight years of age, where there is reason to infer that the vice of masturbation has been long practised. It is, in this class, as well as in widows, and in married women who have either impotent, or nearly impotent, husbands, a consequence of frequently excited and imperfectly gratified sexual desire. Sexual intercourse is imperfectly performed, and although frequently attempted, never duly consummated; and thus congestion of, or active vascular determination to, the uterus is maintained, without conception and its successive changes taking place, whereby the mischief resulting from reiterated and inefficient sexual efforts are prevented.—Hypertrophy of the *neck* of the uterus has already been noticed (§§ 30, 31.). Enlargements which result from the development of tumours in the organ are more appropriately considered in the sequel.

72. iii. Inflammation and Abscess of the Fallopian Tubes and Cellular Tissue.—Inflammation and abscess of the uterine appendages were, until recently, described only as a disease of the puerperal state. Under the head Ovaria, I have considered inflammation and other diseases of these organs, independently of the puerperal state; and in the article on Puerperal Diseases, "*Puerperal Inflammations of the Uterine Appendages*," have received due attention (§§ 187. *et seq.*). It now only remains for me to describe *inflammation and abscess of the Fallopian Tubes and Cellular Tissues, independently of the*

puerperal conditions. This disease has been noticed by MM. GENDRIN, VELPEAU, MARÉCHAL DE CALVI, and by Dr. DOHERTY, CHURCHILL, and LEVER; but it was not fully discussed until Dr. HENRY BENNET directed due attention to it in his work on *Inflammation of the Uterus and Appendages.* This malady in the puerperal states is always severe and generally dangerous; but, in the non-puerperal conditions, it is commonly much more mild, and is often either not recognised or confounded with other diseases. Indeed, inflammation of the uterine appendages occurring after parturition presents as great difference from the same disease in the ordinary state of the system as puerperal metritis offers to non-puerperal metritis. In the puerperal states of these maladies, as I have shown, inflammations of the womb, ovaries, Fallopian tubes; cellular tissues, &c., have a tendency to extend to the peritoneum, or to diffuse themselves, and produce most important and often fatal consecutive changes. But in the non-puerperal form, there is a tendency to assume the sthenic, instead of the asthenic diathesis, and to limit itself to the tissues primarily attacked; peritonitis and other consecutive or fatal alterations rarely occurring.

73. *a. The causes* of non-puerperal inflammation of the Fallopian tubes are the same as those which more commonly produce *metritis* (§§ 10. 22.) and *ovaritis* (§§ 6. *et seq.*); especially arrested menstruation, disordered states of this function, and abortive impregnation.

74. The inflammation may originate either in the cellular tissue, in the ovaries, in the tubes, or in the uterus, the disease of the one structure often extending more or less to the others. This extension of inflammatory action from the one part to the rest and to the peritoneum is most remarkable in the puerperal states (see OVARIA, §§ 6. *et seq.*, art. PUERPERAL DISEASE, §§ 181. *et seq.*), but it is much less so in the non-puerperal condition, the disease being generally limited to the cellular tissue, and to the organs contained between the folds of the peritoneum, this surface seldom being implicated in this condition. Dr. H. BENNET states that he has repeatedly seen inflammation of the Fallopian tubes supervene in females labouring under chronic inflammation or ulceration of the cervix uteri, this latter being the point of departure of the inflammatory action.

75. *b. The symptoms* of non-puerperal inflammation of the uterine appendages are nearly the same as those of acute metritis. (§ 53.) These are the usual febrile phenomena: severe pains in the lower hypogastric region, increased on stretching the body to the erect posture, or on walking; a sense of weight and tenderness deep in the pelvis; difficult or painful micturition and defæcation, &c. These symptoms are also present in metritis; but the pain is greatest in the ovarian region, to the right or left of the median line, where, if the ovarium be much affected, some degree of swelling may be perceived. So nearly, as may be expected, does the one disease approach to the other in characters and course, that, unless there be from the first a deep-seated tumour of an inflammatory nature perceptible in one or both ovarian regions on external pressure, it is most difficult to distinguish the one malady from the other by any other means than by a careful digital examination. The bladder having been emptied, the patient placed on her back, and the knees flexed, the finger should be passed into the vagina, and carried underneath and round the cervix, the left hand being firmly applied over the hypogastric region, above the pubis. By pushing the vaginal cul de sac by the finger in the several directions around the cervix, especially whilst external pressure is being made, the presence of inflammation of the cellular tissue, ovaries, and Fallopian tubes, or of its consequences, is evinced by an unusual resistance on the side or sides of the uterus. "The vaginal cul de sac has disappeared, and resting on the side of the cervix and body of the uterus, there is an indurated swelling, very different from the normal condition, and from what obtains on the other or healthy side, supposing disease to exist on one side only, as is most frequently the case. Pressure on the indurated parts is attended by very great pain, and there is a marked increase of the natural heat." By directing the finger around the inflammatory tumour, whilst the left hand is pressed downwards, the tumour is found to be movable and distinct from the parietes of the pelvis. This tumour being generally situated close to the side of the uterus, seems to form one mass with this organ. Hence inflammation of the lateral ligaments may be confounded with metritis even when a vaginal examination is resorted to, and an inflammatory swelling recognised. If this examination should not be satisfactory, the uterus and appendages may be further examined per anum. Dr. H. BENNET believes that a tumour formed by an inflamed lateral ligament is more intimately connected with the uterus when it is purely phlegmonous, or the result of inflammation of the cellular tissue, than when it is formed by the inflamed ovary. It is, however, very difficult to distinguish between these and acute or chronic metritis.

76. *c. Progress and terminations.*— In the acute stage, inflammation of the lateral ligaments is attended by the usual train of febrile symptoms. As it passes into a *chronic state*, it occasions numerous morbid phenomena, which have been noticed as characterising other chronic uterine diseases, especially dyspepsia, cephalalgia, constipation, palpitation, insomnia, debility, emaciation, evening exacerbations of fever, &c. It may terminate in resolution in the first stage, when promptly and judiciously treated: but, unlike metritis, which very rarely, in the non-puerperal state, terminates in suppuration, inflammation of the Fallopian tubes, especially when seated chiefly in the cellular tissue, generally ends in suppuration —it being purely phlegmonous inflammation.

77. *d. Suppuration* may be expected in the course of a few days from the commencement of the inflammation, unless checked by early and energetic treatment. The occurrence of rigors, followed by sweats, and a temporary abatement of the more acute symptoms, and sometimes a deep-seated fluctuation perceptible to the touch through the vagina, or even through the abdominal parietes, indicate the presence of suppuration. The purulent collection in this part is rarely absorbed; but it generally finds an exit, before the acute inflammatory symptoms have subsided. Adhesive inflammation connects the abscess with either the vagina, rectum, abdominal parietes, or bladder, the contained pus making its way after a variable period in one or other of these directions,

most frequently in the upper part of the vagina, or in the rectum. It very rarely opens into the bladder or abdominal parietes. It sometimes opens in more than one situation successively. The abscess may, however, ulcerate through the peritoneal folds of the lateral ligament, and be evacuated into the peritoneum, causing acute peritonitis; or "the purulent matter may pass along the round ligament and appear in the labia externa, or, escaping from the pelvis along with the large femoral vessels, follow their course, and point in the thigh. These, however, are quite exceptional cases, and are very rarely met with, especially in the non-puerperal form of the disease."

78. *e.* The *abscess* generally opens into the vagina or rectum, or into both. The perforation commonly occurs during exertion, or when coughing, or in the act of defæcation; and the purulent discharge is very frequently either mistaken for an increased flow of the whites, or overlooked when it is passed from the rectum with the stools. This usually obtains when the disease is either not recognised, or viewed as metritis. In some cases, the perforation is attended by a sense of bursting. The discharge may take place a few days after the development of the inflammation, or not until after several weeks. The quantity of pus discharged varies from a few drachms to half a pint. The opening of the abscess into the vagina is the most favourable issue that can occur. The pus occasions some irritation of the vagina, but this is seldom considerable. The opening of the abscess into the rectum is the next most favourable termination, but it generally causes considerable irritation of this bowel, with dysenteric stools or tenesmus. The perforation of the bladder or of the abdominal parietes by the abscess is so rare, and the occurrence so manifest, that the phenomena attending it require no remark, farther than that, as in the case of the rectum, the urine does not pass through the opening, owing to the pressure of the abdominal organs keeping the opening closed.

79. When the pus is discharged, a decided lull is observed in all the symptoms. The deep-seated pains, the tenderness and swelling, and the febrile disturbance rapidly subside. When the abscess has opened into the vagina, the improvement is often rapid, and the patient is believed to be convalescent. But, as Dr. H. BENNET justly observes, this improvement is often deceptive, with reference to the future. On making a careful examination, the tumour on the side of the uterus is diminished in size, and is much less sensitive to the touch; but, although less in size and less inflamed, it is nearly always still perceptible; and the symptoms indicating chronic uterine inflammation generally exist; pain, heaviness, bearing down, tenderness, often swelling in one or both ovarian regions; pain in the back, inability to stand erect, or to walk for any time, or to go up and down stairs, being complained of. The orifice by which the pus was discharged may remain open, or it may close. In the former case the pus escapes as it is formed, and after some time it becomes closed, and the tumour is resolved, the disease being brought to a close in the course of a few weeks, or of a month or two. This, however, occurs only in some cases; for in others the closing of the orifice is followed by a re-formation of the abscess; and before it again escapes, by the former or another opening, the acute inflammatory symptoms previously experienced are reproduced, generally in a mitigated form. The vascular determination attending menstruation favours the reappearance of acute symptoms, and thereby perpetuates the disease. These returns of the malady become less and less frequent as the inflammatory swelling of the uterine appendages diminishes, and as the structures return to their natural condition. "A female who has suffered inflammation and suppuration of the lateral ligaments, even in its mildest form, may be from several months to one or more years before all trace of local inflammation has disappeared, and before she can be said to be radically well." During this period she is never quite free from symptoms of uterine irritation, or of slight exacerbations of her former malady, especially at the menstrual periods, which are often delayed or irregular; the quantity of discharge being generally scanty, seldom excessive. A leucorrhœal discharge is always present, in various quantity. (See PUERPERAL DISEASES, §§ 181. *et seq.*).

80. *f.* *The Prognosis* of this disease in the non-puerperal state is not serious as regards the life of the patient: in the puerperal state it is much more serious (see PUERPERAL DISEASES, §§ 183. and 256. *et seq.*), and often most unfavourable. Apart from this state, this disease seldom terminates fatally, although it entails suffering for months or even for years. Acute metritis generally terminates by resolution, under judicious treatment (§§ 111. *et seq.*), without suppuration, and without consecutive lesion; but inflammation of the lateral ligaments, although apparently not a more severe disease at its commencement, and period of full development, occasions lesions which time only can remove, or which are never completely removed.

81. iv. ASSOCIATIONS OR COMPLICATIONS OF INFLAMMATIONS OF THE UTERUS, &c.—Inflammation of the vagina and vulva may be associated with inflammation of the neck of the uterus, or even with internal or endo-metritis also; and the inflammation may commence either in the vulva or vagina, and extend to the neck of the womb, or in this latter and extend to the former. In cases of *gonorrhœal inflammation* of the neck of the womb, it may be inferred that the inflammation commences most frequently in the vulva and vagina; but such may not always be the case; for it is not improbable that the neck of the uterus is sometimes primarily affected. In the cases, fortunately rare, in which septic or contaminating causes produce an asthenic or diffusive form of vaginitis, as well as in gonorrhœal inflammation, the disease is always prone to extend from the neck to the internal surface of the womb, and even also to the uterine appendages.

82. Various derangements of the uterus, formerly considered as functional, are in most cases merely symptoms or associations of inflammation of the cervix and internal surface of the uterus, as Dr. H. BENNET has fully succeeded in demonstrating, and as I have stated to be the case in several forms of LEUCORRHŒA, and of disordered MENSTRUATION. The leucorrhœal discharge varies with the tissue affected and the nature of the affection. It may consist of natural mucus from the mucous follicles of the vulva, vagina, and cervix uteri; of a white creamy mucus secreted

by the mucous membrane of the cervix and vagina, from congestion of this membrane, such congestion not always amounting to disease; and of a puriform mucus, or a white or ropy transparent mucus mixed with pus, which is always the product of inflammatory action and of its consequences. These three forms of vaginal discharge may be combined in chronic inflammation of the cervix. But this disease may exist without any leucorrhœal discharge whatever, the morbid secretions being absorbed in the vagina. (See art. Leucorrhœa, §§ 19. *et seq.*)

83. Amenorrhœa and other menstrual disorders are often consequences or complications of uterine inflammations. Dysmenorrhœa is very frequently a result of inflammation of the cervix uteri; and when thus associated, other disorders are often superinduced, more especially the several states of hysteria, convulsive affections, spinal irritation, &c. The changes which take place in the cervix and its canal, in consequence of inflammation or ulceration of them, are often such as occasion difficult menstruation as the consequence of contraction of the os internum, or of the canal which forms the cavity of the cervix. The swelling and hypertrophy of the cervix are frequently associated with this contraction, when the cervical canal itself is not the chief seat of inflammation. Dr. Simpson believes that, unless the uterine sound pass, without effort, into the uterine cavity, there is contraction of the os internum; whilst Dr. Henry Bennet contends that there exists, at the os internum, a kind of muscular sphincter, formed by a strong band of the circular muscular fibres of the cervix, and destined to close the uterus during pregnancy; and that this sphincter in the healthy state prevents the uterine sound from passing into the uterus without considerable pressure be made; and he adds, that when the inflammation of the cervix ascends as far as the os internum, or when endo-metritis exists, or the organ is enlarged by the formation of tumours in its body, then the sound passes readily into the uterine cavity, thereby furnishing a sign of the presence of these diseases.

84. It has been considered that *menorrhagia and uterine hæmorrhage generally* are results of active or passive congestion, or of tumours or polypi, or of malignant disease, of the womb. Dr. Henry Bennet, however, contends, and with apparently much truth as well as talent, that, in the absence of malignant disease and of uterine tumours, the quantity of blood lost during menstruation is seldom increased, for a continuance, so as to constitute menorrhagia, and that the menstrual periods are seldom morbidly approximated, unless there exist some degree of chronic inflammatory disease of the cervix, or unless menstruation be finally disappearing. Congestion of the uterus he admits to exist in menorrhagia, but it is generally the result of inflammation of the cervix; and it assumes an active or passive character, according to the constitution of the patient, and to the amount of reaction produced by the disease on the system. If the inflammation is active and has not debilitated the patient, the hæmorrhage is also active or sthenic. If the disease of the cervix has existed long, and has produced anæmia or debility, the hæmorrhage is passive or asthenic. It is difficult to explain the reason why inflammation, granulation, or ulceration of the cervix should, in some cases, render menstruation scanty, too rare, or difficult, and in others profuse or too frequent. But the fact is proved by observation, and it may be referred to the states of innervation of the uterine organs in different persons, and to the sympathies exerted between this very sensitive part of the uterine organs, in connection with the vascular conditions of these organs, and of the system generally. Dr. Bennet, however, believes that, where the inflammation extends to the body of the womb, menstruation is generally scanty or retarded; whereas, when it is limited to the cervix, it is often profuse or more frequent than usual. Although this association of inflammation of the cervix uteri with disordered menstruation is so common, as now stated, still cases occur in which this latter must be referred to other pathological sources. Indeed profuse menstruation is occasionally produced by mere congestion or determination of blood to the uterus, independently of the existence of inflammation of the cervix, especially when the catamenia are finally disappearing. The association of inflammatory ulceration of the cervix uteri with hæmorrhage during pregnancy, in the opinion of Dr. H. Bennet, very frequently exists; the former being the source of the latter, and thus furnishing a natural explanation of the presumed menstruation of pregnant females.

85. That chronic inflammation of the neck and of the body of the uterus should occasion, and be associated with, *sterility*, with *abortion*, with *Hysteria*, in its several forms; with *spinal irritation*, with *chlorosis*, and with various anomalous *neuralgic* and other *affections*, in different cases, according to the circumstances peculiar to the individual, cannot be doubted, although the relation between it and these ailments was overlooked until Dr. H. Bennet and some contemporary physicians, British and continental, insisted upon the fact of its frequent existence. Besides the complications of this disease with these complaints, the former is often associated with other lesions of the uterus itself and its appendages, as with *enlargements*, *polypi*, and *fibrous tumours* of the womb; with the various forms of *displacement* of the organ, with *lesions* of the *ovaria*, and with *uterine phlebitis*.

86. Besides the above associations, others affecting the adjoining organs or parts are not infrequent, and are to be viewed as being much more frequently consequent upon chronic inflammation of the cervix and body of the uterus, than existing as the primary affections. Inflammation of the urinary bladder, or of the rectum and sigmoid flexure of the colon, more especially of their mucous surfaces; hæmorrhoids, and prolapsus or fissures of the anus, and syphilitic disease of the cervix uteri, severally occur as complications of one or other of the forms of metritis. Of these the diseases of the rectum and urinary bladder are chiefly consequences of the extension of severe or protracted inflammation of the cervix and body of the womb, sometimes extending also to the uterine appendages, these latter, in a few instances, being the medium of morbid connection between the different maladies. It is comparatively more rare for disease of the large bowels, or of the bladder, to occasion any of the forms of metritis, than for this last to cause, by the exten-

sion of inflammatory action, one or other of the former. Yet I have seen instances, in the non-puerperal states, of metritis which had supervened on dysentery, and even of asthenic inflammation, that had extended to most of the pelvic viscera, consequent upon a dysenteric attack. Such complications as these are, however, much more frequent and fatal in the puerperal states; and in these the veins are also very commonly implicated. This complication of metritis with uterine phlebitis may occur even in the non-puerperal state, as I have seen in a few instances. In a very remarkable case of this kind, which was seen in consultation with me by Dr. R. LEE, metritis supervened upon dysentery in a married lady, aged about 35 years, and who had not been pregnant for several years. Uterine phlebitis also took place, and was followed by phlegmasia dolens. Inflammation of the cæcum and pericæcal tissues may extend to the uterus and uterine appendages; but this is a very rare occurrence.

87. III. TREATMENT OF INFLAMMATIONS OF THE UTERUS AND APPENDAGES.—Much of what I have stated above respecting the treatment of the nervous and irritable states of the womb (see §§ 13. *et seq.*) is applicable to inflammatory action in either the cervix or body of the organ. It is manifest that, as the several inflammatory states of the uterus, whatever may be their precise seats, occur in the nervous, the debilitated, the anæmied, as well as in the plethoric and the robust, the treatment, especially the general or constitutional, must depend in great measure on the knowledge, acumen, and experience of the physician, by which he is enabled to ascertain the precise peculiarities of each case. A most important part, however, of the treatment is entirely local or surgical; but, in the management of female diseases, no division should be made into medical and surgical means, for here, as in all other departments of practice, surgery, although ancillary to, is also a part of, medicine.

88. i. OF INFLAMMATION OF THE NECK OF THE WOMB, AND ITS CONSEQUENCES.—There are few complaints more prone to relapse, and in its severer states more difficult to remove, than the one now under consideration. But these are not the only evils; the difficulty often of conducting the treatment conformably with the requirements of the case and the prepossessions of the patient, is also a positive obstacle to success, particularly in females whose circumstances of life require exertion, or prevent them from enjoying the requisite comfort and ease, and in unmarried females. The treatment must necessarily depend upon the peculiarities of the case, with what is known or inferred as to its causes, upon the duration of the disease, and upon the alterations which have taken place in the part. But in this, as well as in all other inflammations of the uterus, the *indications of cure* consist, *first*, in subduing inflammatory action and painful symptoms; and, *second*, in restoring the constitutional energies, and thereby the healthy state of the uterus. It often becomes a great difficulty to know when to discontinue the first indication, and when to aim at the second; for a too early adoption of means calculated to restore the health, may occasion a relapse of inflammatory action and its attendants.

89. *A. The treatment before any organic lesions have taken place*, and whilst inflammatory action is unassociated, comprises the two *intentions of cure* just stated (§ 88.). The means which are found most successful in fulfilling the *first* intention, are the horizontal posture, and quietude of mind and body; injections of an emollient, refrigerant, or anodyne kind; cooling diaphoretics, with or without narcotics, warm or tepid hip-baths, local depletions, alteratives, and sometimes derivatives. This state of the disease, especially at its commencement, is so often unattended by severe symptoms, unless when it is associated with the neuralgic and irritable conditions described above (see §§ 5. *et seq.*), that it seldom comes under medical care; and it is not, commonly, until either excoriations, granulations, or superficial ulcerations, very frequently associated with *leucorrhœa, disordered menstruations*, and *deviations* from the natural positions of the womb, that medical aid is resorted to. In all cases, due care should be taken to ascertain the admitted and probable *causes* of the complaint. It will be seen, on referring to these causes (see § 10.), that certain of them can hardly be fully ascertained, although they may be inferred with a near approach to certainty; and, in some cases, they will be admitted by the patient, if inquiries be made with due address. The state of general health should also receive attention, and the treatment be regulated accordingly, and with strict reference to the condition and periods of the uterine functions.

In the *mild cases*, if they have not been of long duration, and if the cause have been only temporary in its operation and not a persistent or habitual vice, means directed to the improvement of the general health, to the regulation and promotion of the secretions and excretions, more particularly to the prevention of fæcal and urinous accumulations, aided by rest, the avoidance of sexual excitement, and by emollient and astringent or refrigerant injections according to the peculiarities of the case, will be sufficient to restore the health, even without strict reference to the succession of indications of cure mentioned above (§ 88.).

90. In *severe* cases, especially in those of long duration, and in those where the above means fail of affording satisfactory relief, the indications of cure stated above should be adopted, more particularly if thickening or enlargement of the cervix or any other of the lesions described as consequences of chronic inflammation be present. For these the means enumerated for fulfilling the *first* indication should be prescribed. For this purpose, constant repose on a couch or sofa, avoiding very warm beds, and the upright or even the sitting posture, vaginal injections, hip-baths, local vascular depletions and a recourse to caustics, are the means of cure now in general use. But, although the chief remedies, they are not the only ones; and in all cases they should be aided by constitutional and moral treatment, by a proper diet and regimen, if indeed the local remedies be not considered as being aids only to the constitutional means. These latter require to be so diversified, according to the temperament, habit of body, strength, and other peculiarities of the case, that a selection of them appropriately to these peculiarities must depend upon the judgment of the physician.

91. *a. Vaginal injections* are often of great ser-

vice, whether *simple* or *medicated*. They wash away the secretion from the inflamed cervix, and prevent the stagnation of it in the vagina and around the cervix; an occurrence tending to increase irritation and morbid sensibility of the parts. The frequent injection of *cold water* only has not only a cleansing but also a tonic and healing effect. In some cases the temperature of the water may be heightened somewhat above fifty degrees of Fahrenheit. But in most cases the temperature of spring water is best, the quantity injected, or the duration of the injection, being regulated by the physician.

92. *Medicated injections* are either emollient, astringent, or anodyne. Various emollient injections are of service in slighter cases, and when pain or irritation is experienced; and they may be made vehicles for anodynes. Milk and water, decoction of marsh-mallows, linseed tea, &c., may be used, cold or tepid. When irritation is considerable, a small quantity of biborate of soda, or of any of the anodynes, especially vinum opii, tincture of henbane, or tincture of belladonna, may then be added to the above. Injections also of the decoction of poppy-heads, either alone or with chamomile flowers, may be prescribed. Astringent injections are very commonly resorted to in this complaint, especially when the discharge is abundant. In this and the above cases, the means advised for the treatment of LEUCORRHŒA (see §§ 16, 17.), and of that state of the disease especially which I have ascribed to "*inflammatory action of the mucous glands of the cervix and os uteri*," (§§ 23, 24.), are quite appropriate. Of the several astringent injections in common use, viz., sulphate of alumina, sulphate of zinc, acetate of lead, solution of nitrate of silver, decoction of oak bark, and solution of tannin, Dr. H. BENNET states that he prefers the first and the solution of nitrate of silver. The first three he uses in the proportion of a drachm to a pint of water, increasing or diminishing the strength according to circumstances. He, however, considers that injections are serviceable chiefly for cleansing the vagina, for diminishing uterine irritation, and for removing vaginal and vulvar inflammation; but that they are generally powerless to subdue confirmed inflammation of the substance of the cervix or even of the membrane lining its cavity; for he believes that their inefficacy in inflammation of the cervical canal is partly owing to the fluid not reaching the region affected; and that in inflammation of the cervix, a remedy which is only applied to the surface can scarcely be expected to subdue the deep-seated disease. When injections are prescribed, due care should be taken that they are properly administered. The patient should be on her back, with the pelvis raised, and means be used for their retention for a time in the upper part of the vagina.

93. When marked irritability and acute sensibility characterise inflammatory action of the cervix, Dr. DEWEES recommends lukewarm flax-seed tea, to be thrown up by a female syringe of sufficient size three or four times a day, and to be retained there for some time by applying a cloth to the vulva. I have more frequently prescribed, especially for unmarried females, in order to remove the more painful symptoms, injections into the rectum, containing either the extract or the syrup of poppies, or compound tincture of camphor, or vinum opii, or tincture of henbane. In a case of remarkable severity which I attended with the late Dr. MOORE, a small quantity of tincture of belladonna was pressed from a piece of sponge contained in a syringe, when introduced as far as the cervix uteri, and always afforded immediate relief.

94. *b. Baths.*—Warm *hip-baths* at the temperature of 90° are occasionally of service. Dr. J. H. BENNET advises them at a temperature of 63° to 85° Fahrenheit, according to the season of the year and feelings of the patient. At this temperature they have a sedative effect, whilst at higher degrees he believes that they determine the circulation to the pelvis. In painful or difficult menstruation, a temperature of 94° to 98° is often decidedly beneficial. Dr. GOOCH states that he has found a partial steam-bath, used by drawing the flannel sack up to the præcordia, so as to enclose the abdomen and extremities, these being exposed to the action of the steam for half an hour every day, preferable to the warm hip-bath. Entire warm baths are useful in winter, when only occasionally resorted to, and when they can be had in the patient's house or apartment. During summer a tepid bath at 65° or 70° is of service every second, or third or fourth day. Cold and shower baths should be reserved for advanced convalescence, and are important means for fulfilling the second intention of cure.

95. *c. Vascular depletions.* — These should be chiefly local; and, with all respect for those who cultivate this speciality, I cannot agree with them in the choice of situation from which the blood should be abstracted. The situation preferred by the more recent writers on diseases of the uterus is the inflamed cervix itself; but the several difficulties in the way of the general physician, if he be averse to the manipulation which this practice involves, and if he have due regard to the feelings of the patient, and even in some cases to sentiments of virgin purity, will induce him to choose other situations than this one from which blood may in this disease be abstracted with advantage, and to have recourse to other and various means by which the end in view may be accomplished. I know that, in all cases, where this and other appliances to the neck of the womb are resorted to by physicians who practise in this especial department, the utmost attentions are paid by them to the modest feelings of the patient and to all decent and even delicate observances; but I should prefer having recourse, in the first place, to such means as cannot be objected to by the sensitive mind, or even by the captious; and leave such measures as may become matters of reproach to both the patient and physician, although most unjustly, to the necessities of the case — as a *dernier ressort* in practice. I may write under prejudice in favour of older modes of practice; for I have employed these and seen the benefits they afford, when judiciously employed and combined; but I nevertheless admit that the measures more recently had recourse to are often more quickly successful, and sometimes succeed after the others have failed.

96. Local abstractions of blood should be directed as near as possible to the seat of pain. Cupping is more serviceable than leeches, particularly when the pulse is full or firm, and the

patient not reduced. In these cases, or when the patient is young and plethoric, or when the menstrual discharge has been scanty for some time previously, a general depletion will be advantageously premised, and more especially when the blood is taken from the feet when immersed in warm water. When pain is referred to the sacrum, cupping may be directed on this part. Leeches are generally most beneficial when applied to the vicinity of the anus, or the labia pudendæ, or to the inner parts of the tops of the thighs just below the vulva or groins. The quantity of blood that may be taken away, should depend upon the habit of body, the state of the circulation, and on the severity and duration of the complaint. My objections to the application of leeches to the cervix uteri are,— 1st, those already hinted at above, and particularly in respect of unmarried females; and 2d, the risk of the application of them to this part being followed by an excessive determination of blood to the organ, or by ulceration of their bites, and consequently increased irritation. It will, however, be admitted that these are contingencies which may seldom occur; nevertheless they should not be hazarded.

97. The repetition of local depletion should necessarily depend upon the effect of the previous operation, and upon the circumstances just mentioned. In cases of long continuance, when the constitution is much enfeebled, even local depletion is but ill-borne, and should seldom exceed from four to six ounces. In these its repetition is rarely attended with much advantage. But when the repetition seems required and gives relief, it should generally be to a smaller amount than the first, and be performed at a time when the return or increase of pain is anticipated. In this way it may be repeated thrice, or even more frequently, to the small amount now named. There are, however, instances where even a small local depletion aggravates the symptoms. These occur, chiefly, in weak, nervous, or anæmied females, and in cases of long standing, or where the leucorrhœal discharge has been long profuse. In this class of patients, the *second indication* of cure (§ 88.) should be immediately adopted.

98. Dr. Henry Bennet remarks that the application of leeches to the cervix uteri, when often repeated, is more frequently injurious than beneficial, and that the consequences mentioned above then frequently result from them. I must, however, refer the reader to his work for many judicious observations respecting the local employment of leeches in this disease. Dr. West states that, "so long as acute symptoms are present, or whenever they reappear in the chronic stage of the disorder, local leeching generally affords more speedy and more decided relief than other remedial means. The leeches should be applied to the uterus itself; not above four in number at a time; nor is it in general expedient to repeat their application above once in a week or ten days. Another precaution consists in never leeching the womb within four or five days of a menstrual period; lest the regularity of that function be disturbed, either by being brought on prematurely or (which is much less frequent) by its occurrence being postponed for several days. The pain which is left behind after menstruation in some of these cases,—in those especially in which the discharge is scanty,—is, however, often very greatly relieved by the application of a few leeches as the period passes off." (*Lect.* p. 140.)

99. *d. Cooling aperients* are generally required both at the commencement, and during the course of treatment, owing to the state of the bowels and to the effects of narcotics taken from time to time. Those aperients which will operate copiously once, or twice at most, and without irritating the lower bowels, are the most eligible. Castor oil, the electuary or confection of senna, either alone or with sulphur and bitartrate of potash, will prove the most certain. In very chronic cases, or when the digestive organs and the system generally are much weakened, rhubarb and magnesia; or the compound infusions of gentian and senna, in equal parts, with tartrate of potash, tincture of henbane, and tincture of cardamoms will be found of service.

100. *e. Narcotics* or *sedatives* are often required, not only in the injections, as advised above, but also in the medicines taken by the mouth, or administered in enemata. They are most serviceable after a gentle action on the bowels has been produced. Camphor, in the dose of one or two grains, with the nitrate of potash and the extract either of henbane, or of hemlock, or of poppy, given in the form of pill twice or thrice daily, or about ten grains of either of these extracts, dissolved in water gruel and injected up the rectum, immediately after the bowels have acted, will frequently afford relief when much pain is experienced. Subsequently the bitter infusions may be prescribed with tincture of henbane, and small doses of nitrate of potash and bicarbonate of potash or of soda. These means also serve to diminish irritability of the bladder by which uterine inflammation is often attended. If deposits of the phosphates exist in the urine, small doses of hydrochloric acid, with tincture of henbane and extract of pareira, prescribed in the infusion of calumba, or of orange peel, generally are of service.

101. *f. External applications* of various kinds have been recommended, as the croton-oil liniment (one part of the oil to ten of simple camphor liniment), by Dr. West, to be applied over the sacrum by means of a sponge twice a day; in order to relieve the back-ache, plasters of opium or of belladonna, to the same situation, and with the same intention; and a small blister, or an anodyne liniment, applied over the part, when pain is urgent in either iliac region. Dr. Oldham advises the following in this latter situation:—

No. 365. ℞. Extracti Belladonnæ ʒss.; Tinct. Aconiti (Fleming's) ℈iv.; Linimenti Saponis Comp. ℥iss. Misce. Fiat Linimentum.

In cases where pain either in the back, sacrum or iliac regions is most severe, I have found more relief procured from an embrocation, frequently recommended in this work, consisting of equal parts of the compound camphor liniment, of the turpentine liniment, with variable proportions of sweet oil and cajuput oil, applied over the part on folds of flannel or spongiopeline, than from any other application. Warm turpentine stupes are also very beneficial.

102. *B. When inflammation of the uterus is attended by granulations, excoriations, ulceration, and hypertrophy of the cervix,* additional means to those already mentioned are recommended, espe-

cially by recent writers on uterine diseases. Dr. Henry Bennet states, that the solid nitrate of silver or a strong solution, should be applied every three or four days to the inflamed mucous membrane covering the cervix, where there is neither ulceration nor hypertrophy of this part; and this treatment should be the first resorted to when the cavity of the cervix is inflamed, "carrying the caustic into the cervical cavity as far as it will pass." When ulceration and hypertrophy of the neck of the uterus are present, he adds that the means already advised seldom succeed in effecting a cure, unless the ulceration be recent, although they mitigate the severer symptoms; a relapse occurring in a short time. Repeated relapses, and a perpetuation of ulceration of the cervix and cervical canal, are the consequences of palliation merely, owing to the repeated determination of blood to the uterus during the menstrual periods. Should the disease not yield (and it seldom does) to the antiphlogistic means directed as above, the most efficacious treatment, he remarks, "indeed the only one that can be depended upon, is by direct stimulation of the diseased and ulcerated surface, and to modify its vitality in such a manner as to induce a healthy action, and, finally, cicatrisation. This end is obtained by the use of caustics of varied strength according to the nature and extent of the disease, its chronicity, and the effects produced." "We must first subdue sub-acute inflammatory action by emollients, depletion, and astringents; and then modify by direct stimulation the diseased surface, so as to substitute healthy reparative inflammation for morbid ulcerative inflammation."

103. The last part to heal in an ulceration of the neck of the uterus is that which dips into the cervical cavity. Dr. Bennet therefore insists upon the necessity of separating the lips of the os with a bivalve speculum, in a good light, and of thus carefully exploring the state of the cervical canal before the disease is pronounced to be cured. Unless this precaution be used, the ulceration may be only partially cured, and the disease will return and extend over the cervix in a few months. The agents recommended for the cure of disease of the cervix—for chronic inflammation, excoriations, granulations, ulcerations, with or without enlargement, induration and deviations—are chiefly the more energetic caustics, which he enumerates in the order of their powers of cauterisation:—The solution of, and the solid nitrate of silver, the mineral acids, the acid nitrate of mercury, potassa fusa, potassa cum calce, and the actual cautery. It is obvious that a recourse to either of these requires both address and careful appliances. The nitrate of silver, acid nitrate of mercury, and potassa cum calce, are chiefly recommended by British writers on uterine diseases; these and the actual cautery also being much employed by French physicians. For very full directions for the use of these caustics, I must recommend the reader to the works of Dr. J. Henry Bennet, Dr. Simpson, and of the other writers mentioned above; but as the directions given for the use of these means by Dr. West are more succinct, I shall give them nearly in his words; premising, however, that the able and experienced physicians now named generally have recourse to the more energetic of these caustics in the most severe and protracted cases, and when more or less hypertrophy of the cervix is associated with other lesions.

104. When the granulations on the os and cervix uteri become large, soft, very vascular, and bleed easily, the surface furnishing a copious glairy discharge, sexual intercourse being painful and often followed by bleeding, Dr. West then recommends "extensive scarifications, which may be followed by the daily application of powdered alum on a piece of cotton wool, or by the introduction of a piece of cotton wool soaked in a strong solution of alum. By means of a piece of thread tied to the cotton wool, it can be removed by the patient herself in the course of a few hours, though it must always be introduced through the speculum. In the greater number of instances the state of the os uteri becomes so much improved in four or five days, that this mode of treatment may then be dispensed with, and the sedulous employment of strong astringent injections will usually suffice to complete the patient's cure. When this is not the case, but the morbid condition still continues, more powerful applications may be needed. The nitrate of silver is not in general suitable in these cases, for its application is often followed by pain, and also by bleeding. The acid nitrate of mercury, both in this instance and also whenever a strong caustic is required, has seemed the most useful application; and with moderate care its employment is unattended by risk. When it is used, however, the patient must lie on her back, and one of Coxeter's bivalve speculums being introduced so as thoroughly to expose the os uteri and include the cervix, a little cotton wool must be carefully disposed all round the edge of the speculum, so as to absorb any of the superfluous acid, and to prevent it from running down outside the speculum, and thus injuring the vagina. A brush can easily be extemporised by trimming a little piece of cotton wool after it is placed in the holder, and the whole diseased surface may then be painted over with the caustic, which immediately forms upon it a white eschar. A piece of dry cotton-wool now pressed against the part will absorb any superfluous caustic; the little strips placed around the edges of the speculum may then be removed, and the speculum withdrawn." As an additional precaution, a piece of moistened cotton-wool may be introduced up to the os uteri, before the withdrawal of the speculum, whence it may be removed in the course of a few hours by the patient. "It is seldom that either pain or bleeding follows this application; and at the end of a week the eschar will usually be separated; the surface will be found to have lost its fungous character, and cicatrisation to be commencing at its edges. A zinc lotion of about five grains to the ounce, or the black wash employed as a vaginal injection twice a day will now generally be sufficient; but sometimes the surface puts on an indolent character again, and it may then be expedient to touch it once or twice with the nitrate of silver, and I have occasionally found it necessary to repeat the application of the acid nitrate of mercury." (*Lect.* p. 146.) Dr. Henry Bennet employs, as escharotics, either the acid nitrate of mercury, or the potassa cum calce, fused in sticks of three different sizes, according to the peculiarities of the local lesion; and gives ample directions for the use of these and other caustics, appro-

priately to the circumstances of the disease. He, however, admits that cauterisation of the cervix is an operation not without danger, and must not, therefore, be either injudiciously resorted to, or carelessly carried out. Although his own "practice has been hitherto free, or all but free, from serious accidents, the same immunity cannot always be expected. Indeed, I recently learnt from M. Gendrin that within the last few years he has had several cases of acute metritis and of abscess in the lateral ligaments, the evident and immediate result of deep cauterisation. But he also tells me that he has seen the same results follow the use of the nitrate of silver and of injections; and I may mention that the two most severe instances of acute metritis that I have myself witnessed for some time in the unimpregnated womb occurred after the use of weak astringent vaginal injections." (*Op. Cit.*, p. 426.) I believe, however, when vaginal injections are followed by those severe results, that the inflammation of the cervix, or the leucorrhœa, for which these means were used, was only a part of the existing lesion; and that endo-metritis, or a chronic metritis, had also existed at the same time, and was developed into the acute state by the injections.

105. C. *Treatment of Hypertrophy and Induration of the cervix uteri.*—These changes are the results of repeated congestion, or of inflammatory congestion and of nutritive hypertrophy. The continued existence, or repeated recurrence of inflammatory congestion gives rise to increased development of the vessels, to the exudation of plastic lymph, and to the partial organisation of this lymph, and to greatly increased size and density of this part of the uterus, often extending partially to the substance of the uterus itself, and associated with *chronic metritis* (§§ 62. *et seq.*). This lesion is commonly attended by more or less prolapsi, and often with deviations. The enlarged cervix may, moreover, be excoriated, ulcerated, or covered by granular formations, owing to the alterations of its follicles. The *local means* of cure are those already recommended, aided by the constitutional treatment hereafter to be noticed (§§ 106. *et seq.*). Dr. H. Bennet states that, "if hypertrophy resists the ordinary antiphlogistic means of treatment, it never withstands the melting influence of deep cauterisation with potassa, or the actual cautery." Of the two he prefers the potassa, or potassa cum calce, Dr. West the acid nitrate of mercury. The actual cautery may therefore be dismissed. It should be clearly understood that these means are not intended to destroy the hypertrophied cervix, "but merely to set up an artificial eliminatory inflammation, by means of an eschar or issue, *of limited extent*, established in the centre of the hypertrophied region. I do not calculate, in the remotest degree, on the destruction of tissue to which the caustic or cautery gives rise, for diminishing the size of the hypertrophied cervix; but solely and entirely on the *inflammation subsequently set up.*" An eschar, of the size of a shilling, will answer the purpose of reducing the hypertrophy. It may be necessary to apply the caustic several times. "The ulcerations occasioned by the deep application of potassa heal very rapidly, even when left to themselves. It is better, however, to touch them at intervals with the nitrate of silver, to prevent the granulations from becoming too luxuriant, and to favour the cicatrisation which usually takes place in from four to six weeks."

106. D. *Constitutional and general treatment.*—The constitutional treatment of chronic inflammation of the cervix and os uteri, and its usual consequences, should not be overlooked, even whilst local means are being applied. Indeed, in many cases, this treatment should precede a recourse to local measures, these latter only following the failure of the former. In some of the more recent works upon this and other diseases of the uterus, too little importance is attached to the recognition of the causes of the existing malady, and upon the prevention and removal of these causes, which, when removed, the salutary efforts of nature would then, of themselves, often effect a cure. In this disease, especially, as well as in the displacements and deviations of the uterus, sexual excitement and self-pollution are the most frequent causes, and these are usually allowed to continue, owing to the difficulty and delicacy of the subject, to ignorance of medical men of the great frequency of this vice, and to an equal ignorance of the immorality and injurious consequences of it on the part of those who indulge in it.

107. The constitutional treatment which I have adopted for many years, when uterine irritation, as it was then termed, or when chronic inflammatory irritation, as more recently shown, was present, always was much modified, according to the features of the case. If *leucorrhœa* was its prominent character, the means advised when treating of this complaint were prescribed. If the *menstrual function* was disordered, the treatment recommended for the various forms of such disorder was had recourse to; and, whenever inflammatory irritation of the uterus was inferred, then means more or less antiphlogistic were advised, often conjoined with tonics, and with other remedies adapted to the peculiarities of the case. In a very large proportion of the cases of this complaint, the causes which have produced it, and the discharges which characterise it, as well as its exhausting nature and duration, have produced so much debility and irritability, and so extensive a range of sympathetic disorders,—nervous, neuralgic, hysterical, cerebro-spinal, vascular, and anæmic—as to imperatively require constitutional treatment, however much the local means above described may be required or confided in. What this treatment should be, or how conjoined with regimen and local measures, must depend upon the acumen of the physician, and upon the appropriate use of each or of all in particular cases and circumstances. But in most cases, the patient should recline on a cool hair couch, should sleep, if married, apart from her husband, on a hair mattress, and avoid very warm feather or down beds, all sources of sexual excitement, and whatever appears to aggravate her complaints. She should preserve an open state of the bowels by means of cooling aperients, or of these conjoined with tonics. The bicarbonates of the fixed alkalies may be taken with the nitrate of potash in bitter infusions; or the liquor ammoniæ acetatis with nitrate of potash, in similar vehicles. The terebinthinate embrocation already advised (§ 101.) may be employed externally, and a cooling, and yet tonic or restorative, regimen and diet adopted, avoiding much animal food, and

all heating and stimulating beverages, as well as coffee and strong tea. In a severe and tedious case, for which I was consulted by Mr. BARNWELL, the following pills proved of very great service: —

No. 366. ℞ Camphoræ rasæ ℈j.; Potassæ Nitratis ʒj.; Sodæ Sub-carb. exsic. ʒss.; Extr. Hyoscyami ℈ij.; Syrupi papaveris q. s. Misce. Fiat massa æqualis, quam divide in Pilulas xxx., quarum binas, ter in die capiat.

After these were taken for some time, they were replaced by the infusion of calumba, bicarbonate of soda, tincture of calumba, and tincture of hyoscyamus.

108. In the above manner, the *second indication* of cure may be initiated, and may thus advance to a more tonic and restorative or nutritious treatment, so as to restore the constitutional energies, and, thereby, the healthy state and functions of the uterus. This end can be attained only by medicinal and regiminal means, both of which, however, should be commenced with caution. In a few instances, I have prescribed, with marked benefit, the *cod-liver oil*, on the surface of a tonic infusion, with one of the mineral acids, as the compound infusion of orange peel with sulphuric acid; or the compound infusion of roses, or the infusion of cinchona with hydrochloric æther, or hydrochloric acid, or with both. In other cases, the tonic or bitter infusions or decoctions may be ordered with the alkaline carbonates, nitrate of potash, and tincture either of henbane, or of some other anodyne. In cases which have been of long duration, or have been caused by self-pollutions, or which are characterised by shattered health, by pallor of the countenance, cold extremities, and more or less anæmia, the milder preparations of iron, as the tincture of the muriate, or of the acetate of iron, may be prescribed with the preparations of calumba or quassia. Dr. DAVIES states that he has given, in these cases, the phosphate of iron with much benefit. In some cases, especially where there is hypertrophy of the cervix uteri, the iodide of iron may be tried in the syrup of sarzæ; or the iodide of potash may be taken with either the bicarbonate of potash or the solution of potash in a tonic infusion, &c.

109. The *mineral waters*, natural or artificial, may likewise be resorted to, according to the peculiarities of the case. The Bath and Tunbridge waters, the Harrowgate waters, the waters of Seltzer, Geilnau, of Ems, of Vichy, of Pyrmont, &c., have been severally recommended, and found of some service. The *regimen* and *diet* of the patient are of much importance. If married, she should sleep apart from her husband; and whether married or unmarried, she ought to avoid all causes of excitement and irritation. She should enjoy the advantages of a cool and pure air. The *diet* ought, whilst febrile and inflammatory symptoms are present, to be light, cooling, and chiefly farinaceous; and animal food should be given in very small quantity, until convalescence is advanced, when it may be taken more liberally. The beverages may consist of toast-water, barley-water, or of lemonade, or of the imperial drink. Afterwards, when recovery is far advancing, the Rhenish wines, or claret, or claret and water, &c., may be allowed. In most cases, coffee and tea are inappropriate. Cocoa, or cocoa-nibs, prepared in a simple manner, and dry-toast with little butter, should be preferred. Patients who have caused this complaint by self-pollutions, have generally great appetites; and their indulgences in food and in their unnatural vice tend to perpetuate the disease, and to frustrate the treatment. For them, the diet should chiefly consist in a large proportion of vegetable and farinaceous substances, whereby the stomach may be filled with as little excitement of the circulation as possible. The mind should always be occupied by useful pursuits, and, as much as may be, by agreeable employments.

110. E. *Treatment of inflammation of the cervix uteri in the unmarried, during and after pregnancy, and in advanced life.* — A well informed practitioner may apply what has been already adduced to these circumstances of life; but with due care and precaution. In *unmarried females*, the great difficulty of treatment is in the local or instrumental part; but a recourse to it will depend much upon the severity and other peculiarities of the case, and upon the results of constitutional treatment, which should be previously employed; the causes of the disease having been ascertained, and removed as far as possible. "The existence of *pregnancy*," Dr. H. BENNETT states, "so far from being an obstacle to the local treatment of inflammatory and ulcerative disease of the uterine neck, is a strong reason why it should be adopted and carried out without delay, unless the patient have reached the latter period of her pregnancy. If so, as the child is viable, and it is rather difficult to bring the cervix fully into view, it is as well, unless the symptoms be urgent, merely to resort to astringent injections, and to reserve all instrumental treatment until after the confinement." In the early or first six months, the local treatment, Dr. B. states, must consist in astringent injections, and cauterisation with the nitrate of silver, or the acid nitrate of mercury; the potassa cum calce being much too powerful in these cases. If ulcerative disease of the cervix exist after an *abortion* or *confinement*, he never interferes until four or five weeks have elapsed, and he then cauterises the diseased surface with the nitrate of silver. If blood be poured out from the ulcerated surface, the cauterisation invariably stops it; and the case then falls into the general category. But it should be recollected that, during lactation, the mucous surface of the cervix and vagina presents a vivid red or congested hue, from sympathy with the mammæ and nipples; hence this condition should not be mistaken for inflammation, and ought not to be interfered with by treatment. The disease of the cervix in females *past the menstruating age*, is generally intractable; and requires the most powerful caustics; but having been removed, the cure is permanent.

111. ii. TREATMENT OF ACUTE INFLAMMATION OF THE INTERNAL SURFACE AND BODY OF THE UTERUS. — Although the treatment of *endometritis*, by local means, is supposed, especially by some French writers, to be appropriate to this state and seat of the disease, yet such means, however cautiously resorted to, cannot fail of being more or less dangerous. As this form of metritis frequently commences in the cervix or its cavity, extending to the cavity, and to some extent, in most instances, to the substance or body of the organ, and in some cases also to the broad ligaments, these circumstances should always be considered, and the treatment should be prompt

and decided. If the patient be young, or strong, or plethoric, especially if the disease has followed the suppression of the catamenia, or of other evacuation or excretion, blood should be taken from the arm, or from a vein in the feet immersed in warm water, and cooling diaphoretics and aperients exhibited. The warm or tepid bath, or hip bath, may follow the depletion; and, if the pain be severe, camphor, nitrate of potash, and extract of henbane, or extract of belladonna, or a minute dose of aconite, may be prescribed every four or five hours; or after longer intervals, if the belladonna or aconite be given. In the cases just described, local depletions — by leeches applied over the ovarian regions, or below the groins, or by cupping on the loins or sacrum — may be directed after the *blood-letting*, especially if this latter has not produced the desired amount of benefit; indeed in most cases the local depletions will also be required. In milder cases, and in less robust or plethoric females, the local depletions, when resorted to with decision, will generally be sufficient, especially when the internal or general treatment is judicious. Their repetition may, in some cases, be required, but this, as well as the quantity of blood which should be taken, should depend upon the severity and other features of the case. After the local depletions a tepid bath, and subsequently the terebinthinated epithems and embrocations already advised may be placed over the hypogastric region, the flannel on which the embrocation is sprinkled having been either warmed or wrung out of hot water.

112. These measures having been employed, time should be allowed for their operation, and for the subsidence of the disease. This latter object will, however, be promoted by rest in the horizontal posture; by the avoidance of sexual excitement; by recourse to cooling diaphoretic medicines, especially the liquor ammonia acetatis, with small doses of the vinum or liquor antimonii tartarizati, and some anodyne or narcotic. The only aperients allowed should be cooling and such as may not irritate the rectum: as the citrate or carbonate of magnesia; the phosphate of soda; the acetate or tartrate of potash, prescribed in emollient vehicles, or with either of the preparations of senna or rhubarb. Calomel, or calomel with opium, should not be given in metritis, as it is apt to aggravate the complaint by irritating the rectum; and medicines containing aloes should also be avoided.

113. The *regimen* and *diet* of the patient should be strictly antiphlogistic, and the beverages allowed ought to be demulcent, emollient, and slightly alkaline. As convalescence advances, the alkaline mineral waters of Vichy or Ems may be allowed. When the disease is neglected, or improperly treated, it may extend to the broad ligaments and ovaria, as shown above (§§ 72. *et seq.*), or it may lapse into a chronic state; which state, however, may be primary, although it is much more frequently a consequence of chronic inflammation of the cervix, or of the cavity of this part, or of the body of the organ, and is most frequently partial or limited in its seat, as shown above (§ 64.).

114. iii. The Treatment of Chronic Metritis. — Chronic metritis, often commencing in the cervix, is also frequently kept up by the inflammation of this part and its consequences. In most cases, therefore, the disease of the cervix should be first and chiefly attacked, by the means already advised for the several morbid conditions of this part (§§ 102. *et seq.*). The chief local means are, rest in the horizontal posture, emollient or astringent vaginal injections, the occasional application of leeches to the cervix, before or after menstruation, according to the period at which they appear most serviceable, and a recourse to anodynes when the sufferings of the patient are severe. These latter, or the narcotics already mentioned (§ 93.); a recourse to belladonna, both locally and internally, or to chloroform, or to the hydrochloric æther, or hydrocyanic acid, &c.; the introduction of opiate or other anodyne injections or suppositories into the rectum or vagina; and the external embrocations and epithems already advised (§ 101.), are the chief means by which we may hope to remedy this state of disease. In obstinate and protracted cases M. Gendrin and Dr. H. Bennet have had recourse to an issue formed above the pubes, keeping it open for some months. In a severe and prolonged case, which I attended with Mr. Flockton, many years before the appearance of this recommendation, I directed an issue to be made below both groins, with the most complete success.

115. The enlargement, partial or general, of the cervix and body of the uterus, in protracted chronic metritis, suggests, not merely the local measures noticed above for reducing this enlargement, and the other evils which usually attend it, but also such other general or constitutional means as are sometimes found of service in removing other states of enlargement, morbid deposition or growth. These means may not be of much avail in the disease now under consideration; but the most important of them may be so employed and combined as to very considerably improve the general health, which is usually injured by the local malady, and to alleviate the sufferings of the patient. These means are, the bi-chloride of mercury, the preparations of iodine, the iodide of arsenic and mercury, the fixed alkalies and their salts, and the preparations of sarza, severally but separately conjoined with tonics, anodynes, or narcotics, &c. On these principal medicines I proceed to offer a few remarks, in respect of the treatment of chronic metritis and its complications, especially when characterised by enlargement of any part of the uterus.

116. The *bichloride of mercury* is beneficial or injurious, according to the manner of prescribing it. It may be of service even when the constitution has been very remarkably injured by this protracted malady. But it should in most instances, and in these especially, be prescribed either in the fluid extract of sarza, or in the compound tincture of cinchona, or in the decoction or in mixtures, consisting chiefly of all these, with or without some narcotic, as the tincture of conium, or of henbane, &c., or with a few drops of the tincture of opium, or with the compound tincture of camphor, if the medicine should have too relaxing an effect on the bowels. This substance, thus taken, in doses varying from the sixteenth to the eighth of a grain, has a very salutary tonic and alterative effect, even although the hypertrophy of the uterus may not be much, or even at all, reduced by it.

117. The preparations of *iodine* are of service only when given in small doses, and continued for a considerable time. The *iodide of potassium* I have, in these cases, prescribed in doses of one to two grains, thrice daily, with the bi-carbonate of potash, or liquor potassæ, or Brandish's alkaline solution, in a tonic infusion or decoction, or as I have prescribed the bichloride of mercury (§ 116.). The *iodide of mercury and arsenic* is sometimes of service when extemporaneously prescribed in the compound fluid of sarsaparilla, or in any better infusion. The *iodide of iron* may also be given in the form of pill (see *Form.* 535.), or in the syrup of sarsaparilla, but in moderate doses, and in cases evincing more or less anæmia, and when there is reason to suspect that the disease has been caused or prolonged by self-pollutions. In these cases also the carbonates of the *fixed alkalies*, the tartrates, the nitrates, &c., are of service, when taken in tonic or bitter infusions, and conjoined with *anodynes* or *narcotics*. I have had reason to believe that the combinations of the *bi-borate of soda* with these, in doses sufficient to preserve the bowels in an open state, without offending the stomach, has been of more service in reducing hypertrophy of the uterus, whether partial or general, than any other means.

118. Dr. H. Bennet states that, when all ordinary therapeutic agents fail to remove chronic inflammation and induration of the uterus, he has established, as a counter-irritant, an artificial ulceration or issue, in the neck of the uterus itself, with potassa fusa, or potassa cum calce, independently of any disease of that region, and with very great benefit to the patient.

119. As the chronically inflamed and enlarged uterus often falls back upon the rectum, thereby causing constipation, and painful defæcation, especially when the fæces are more or less solid, care should be taken to preserve the bowels in an open state. The means which I have usually preferred are electuaries, composed of the bi-tartrate of potash, the bi-borate of soda, and the confection of senna, sometimes with sulphur, and with any suitable syrup; which may be taken every night. They have a deobstruent effect upon the uterus, whilst they preserve a lax state of the bowels. In cases where emaciation or anæmia are prominent, in addition to nutrients, restoratives, or tonics, as circumstances have suggested, I have prescribed the cod-liver oil, and more recently this oil containing some one of the preparations of iron, of iodine, or of mercury, &c.

120. iv. The Treatment of Enlarged Uterus hardly differs from that recommended for *chronic metritis* (§§ 114. *et seq.*). Rest, attention to the secretions and excretions; cooling saline aperients and diaphoretics, local depletions, in moderate quantity, at intervals of about a fortnight; the preparations of iodine in small doses, with alkaline solutions or the bicarbonates; the bichloride of mercury in minute quantity, either alone or with the preparations of cinchona; the liquor potassæ with sarsaparilla; and more especially the avoidance of sexual excitement, and of all heating or stimulating beverages, and the recumbent posture, on a cool sofa, and on a hair mattress at night, are the means which will alone be of any service, if they be perseveringly adopted.

121. v. Treatment of Inflammation and Abscess of the Uterine Appendages. — At an early stage the treatment of Inflammation of the Uterine Appendages is the same as that advised for Acute Metritis (§ 111.). But in order to prevent suppuration, which is very much more liable to occur in the former than in the latter, more prompt and more decidedly antiphlogistic measures are required, especially general and local blood-letting. If, however, these means fail in preventing the formation of *pus*, or in procuring the absorption of whatever may have already formed, the purulent collection will find its way to the exterior, by the vagina, rectum, abdominal parietes, or bladder. In these circumstances, we can only endeavour to control the symptoms, by means suitable for this purpose, to assist nature in throwing off the morbid formation, in the direction to which she points, to support the constitutional powers of the patient, in order that this end may be attained, and to palliate the more distressing symptoms which present themselves. The treatment advised for chronic metritis is suitable for this stage of the disease. If the abscess open into the urinary bladder, the means required will be suggested by the state of the urine. If this excretion continue acid, the carbonates of the alkalies, with demulcents, opiates, or other anodynes, will be most serviceable; and tonics, restoratives, the preparations of buchu, or pereira, &c., be also required. If the urine become ammoniacal, or even neutral, the mineral acids, with cinchona, quinine or other tonics, opiates, &c., should be exhibited. If the abscess open in the rectum, or flexure of the colon, the consequent tenesmus, and other dysenteric symptoms, will subside after a short time, if, with restorative and anodyne medicines, amylaceous or mucilaginous injections, with opiates, be administered. The bursting of the abscess into the vagina terminates favourably if the constitutional powers be supported, and the unpleasant symptoms palliated, the vagina being occasionally washed by a lotion of tepid or of cold water. If the abscess point externally, tonics, with alkalies, and attention to the excretions, are necessary; and as soon as fluctuation and redness of the tumid surface appear, an opening, made by the lancet, should not be delayed. Afterwards, the powers of life should be duly supported; and the ingress of air into the cavity of the abscess carefully prevented, whilst the reaccumulations of matter should be prevented or moderated by gentle pressure; and whenever any collects, it should be discharged.

122. IV. Inflammations of the Uterus and Appendages of a Specific Nature. — Inflammation of the uterus may be caused by gonorrhœa or by syphilis — by gonorrhœa more frequently than is generally supposed, by syphilis very rarely. — i. I have seen several cases of gonorrhœal inflammation of the womb and appendages, and in every case the disease was most severe; and whether extending to the os and cervix uteri from the vagina, or by possibility commencing in the former, owing to the direct contact of the morbid matter with that part, the inflammation had advanced along the canal of the cervix to the internal cavity of the uterus, and in three cases to the broad ligaments and ovaria, — in one to both ovaria, and in another to the ovarium of the left side and pelvic peritoneum.

Mr. Acton in his excellent work on "*Diseases of the Urinary and Generative Organs in both Sexes*," has treated this subject in a chapter on "Blennorrhagia of the vulva, urethra, vagina, uterus and ovary," but he views the disease as in all respects the same as inflammation of those parts occurring independently of a specific contagion. That it is the same as respects the inflammatory condition — that it is an acute form of inflammation there can be no doubt, but that it is more severe, more disposed to extend to the uterine cavity and appendages, than common inflammation, whether acute or chronic, commencing in the cervix uteri and produced by other causes, would appear from the cases I have treated. All these cases were of married women, the gonorrhœal infection having been communicated by their husbands; and, in all, the infection was most manifest, the patients not being previously subject to any leucorrhœal discharge, and was followed by most severe symptoms of inflammation of the womb, and by the extension of the inflammation still further, as stated above. On this subject Mr. Acton remarks that, "a female suffering under uterine blennorrhagia may be seized with shivering and a feverish state of the system; vomiting may come on, together with pain referred to the iliac fossa, where more or less tension may be present (in no way resembling the superficial pain produced by peritonitis); but if the finger be carried up the *cul de sac* of the vagina, and the patient desired to turn upon the opposite side, pain of a most acute kind will be felt. The blennorrhagia may cease for the moment, one ovary may be attacked only, or both simultaneously, as in epididymitis; revulsion will explain the partial cessation of the discharge. Lastly, we believe that a great number of ovarian dropsies may result from a chronic inflammation of that organ, the consequence of such complications." (*Op. cit.* p. 308.). I can fully confirm the correctness of this last remark by a recent case of ovarian dropsy which occurred in the wife of a very eminent man, and was the ultimate lesion which followed gonorrhœa communicated by her husband. She was from the commencement, and is still, under my professional care.

123. i. Syphilitic Ulceration of the Cervix Uteri. — Both Dr. Henry Bennet and Mr. Acton agree in considering syphilitic ulceration of the cervix as a rare occurrence. The latter remarks that, in the vagina and os uteri, the circumstances favouring contagion do not often occur, for if the contagious pus of chancre reaches as far, it is generally deposited on a layer of mucus, which protects the membrane beneath. He concludes that "ulcerations of the neck of the uterus are in ninety-nine times out of a hundred merely simple affections, the result of acute or chronic inflammation, very intractable in ordinary treatment, and will persist an almost indefinite time, unless we employ local applications." True syphilitic ulcers of the cervix uteri are described by Mr. Acton as differing from all other ulcers of this part. "They are small, covered with a chamois leather secretion, which it is difficult to remove, their edges are distinct; they look as if a portion of mucous membrane had been punched out of the os uteri, and inoculation has shown that they were true chancres, situated on this unusual position." (*Op. cit.* p. 292.)

124. iii. *The treatment* of these specific diseases of the uterus is not different from that advised for the affections above described. — *A.* As respects *gonorrhœal* inflammation of the womb and its appendage, the means are the same as those advised for the more acute inflammations of these parts; the chief modifications consisting in a more prompt and decided use of these means, especially when the symptoms are very severe. In many cases, the inflammation of the vagina is so severe, and the swelling of both it and the vulva so great, as to prevent a recourse to many of the means already advised, especially at an early stage, injections of an emollient and anodyne kind being first prescribed, and sedatives, demulcents, refrigerants, and narcotics internally. In other respects, and as the disease continues or is prolonged, the remedies already recommended for inflammation of the uterus and its appendages, should be administered appropriately to the peculiarities and complications of individual cases.

125. *B. The treatment of syphilitic* ulceration of the cervix consists in the use of the acid nitrate of mercury locally, as directed above (§ 104.), and in the employment of the constitutional means indicated by the existing state of the case, and by the appearance of any signs of Venereal Cachexia (*see that article*).

126. V. Displacements of the Uterus. — The womb being suspended in a cavity more or less capacious, but liable to alterations in the extent of its capacity; its supports being not only yielding, but also admitting of considerable mobility; its manifest changes in size and position during pregnancy; and its movements during coition, and the venereal orgasm, are circumstances requiring consideration whilst endeavouring to describe and explain displacements of the uterus, as well as to remedy these evils. The causes of these disorders are often manifest, but in some cases they can only be inferred from insufficiently conclusive evidence. It is not to be disputed, that an enlargement of the organ will favour its descent; that muscular efforts, especially lifting heavy weights, will have the same effect, even independently of enlargement, and particularly when the vagina and ligaments are relaxed by child-bearing, leucorrhœa, &c.; and that partial or general enlargement, the pressure of loaded adjoining viscera, too severe or prolonged exertion, especially during the menstrual period, falls on the back, hips, concussions of the trunk of the body, &c., will occasion either that or other forms of displacement.

127. It should not be overlooked that, in the great majority of instances of displacement of the womb, other lesions of the organ, either inflammatory or structural, are associated with the displacement. This circumstance is of no mean importance both in recognising the cause, conditions, and relations of displacement, and in regulating the treatment and regimen of the patient.

128. i. Descent or prolapse of the womb is the most common form of displacement; and proceeds from increased weight of the organ, or from impaired tone of its supports. — *A.* Dr. West has considered this lesion with reference to its *grades*, and divided it into the *first*, *second*, and *third* degrees of prolapse. "In the *first* degree the organ is merely lower than natural, but still preserves its proper direction, its axis corresponding

with that of the pelvic brim, and this, even though it should be so low that its cervix rests upon the floor of the vagina. In prolapsus of the *second* degree, the uterus is situated with its fundus directed backwards, its orifice forwards, so that its long axis corresponds with the axis of the pelvic outlet. In prolapse of the *third* degree, or as it is often termed, *procidentia* of the uterus, the organ lies more or less completely externally, hanging down beyond the vulva, though it generally admits of being replaced within the vagina, if not of being altogether restored to its natural position." It is obvious that a due recognition of the circumstances, both physical and pathological, favouring and causing this displacement, is of the greatest importance in preventing and removing the different grades and complications of it observed in practice. The womb is not merely suspended by the duplicatures of the peritoneum within which it is contained, but it is also poised upon the vagina, which, in the healthy virgin state especially, furnishes it very considerable support. The curved direction of the vagina, the connection of the organ, appendages, and vagina with the adjoining viscera, with the pelvic and perineal fasciæ, &c., also aid in supporting the uterus in its situation.

129. These combined supports, however, may severally be relaxed or overcome during the epochs of life following puberty. In the virgin and unmarried state, leucorrhœa, menorrhagia, anæmia, exhausting discharges, and frequent excitement of the venereal orgasm by masturbation, severally tend to relax the tone of the parts which support the womb in its natural position. During the sexual orgasm its mobility is manifested to the greatest natural extent, its descent often occurring in various degrees, without becoming greater than is consistent with the healthy function; but it is obvious that, when unnaturally produced, the healthy condition is at last exceeded, and that more or less displacement is apt to occur, especially as the same cause practised to excess tends remarkably to relax the tone of the parts upon which the healthy position of the organ depends. In the married state, as well as sometimes in the unmarried, although more remarkably and much more frequently in the former, enlargement and greater weight of the womb, and the stretching, relaxation, and other changes of the supporting parts consequent upon abortions, child-bearing, difficult labours, and puerperal diseases, very materially predispose to the descent and other displacements of this organ. If, in these circumstances, the erect posture be too early resumed after delivery or abortion, if falls or concussions of the trunk of the body be experienced, or if violent muscular efforts be made, as in lifting or carrying heavy weights, a greater or less descent, or hernia of the uterus is apt to take place. Aged and emaciated females, married or unmarried, are most frequently liable to this displacement, sometimes to its utmost extent, owing to the absorption of the adipose tissue adjoining the vagina and vulva, especially when the exciting causes just mentioned have occurred.

130. Descent of the uterus, even in its first and second degrees, is very commonly attended by some degree of retroversion; and this state is often, as well as the descent, increased by constipation of the bowels; the hardened fæces, in the efforts at defæcation, augmenting the extent of both states of displacement, by pressing upon the fundus of the uterus. Dr. **West** justly remarks that "the close connection between the cervix uteri and the neck of the bladder is a temporary obstacle to the complete descent of the womb, while, at the same time, it favours the retroversion of the organ; but, if at length this yields, the urine accumulating in the bladder distents its fundus and the vaginal anterior wall into a pouch which drags down the uterus in front just as the prolapse of the rectum drags it down behind; and the organ now soon comes to lie beyond the external parts; the case being thus converted into one of procidentia uteri, or of prolapse in the third degree." (*Lect.* p. 156.)

131. This displacement of the uterus is, in the course of time, followed by still further changes. The neck of the womb, being the first part protruded, and the most exposed to irritation, becomes more and more hypertrophied, and often excoriated; the enlargement being both in length and thickness. The protrusion of this part of the organ is partly due to inordinate growth, its thickness being sometimes equal to, or even greater than, that of the wrist. The lips of the os uteri become enlarged with the rest of the organ, and the transverse opening formed in women who have had children, is converted into a wide opening situated deeply between projecting lips, whose surface is irritated, excoriated, vividly red or granulated, and covered by an albuminous secretion. The prolapse beyond the vulva may continue only in a partial state for years, the fundus and a portion of the organ remaining within the pelvis, while the neck and the lower part are external. In this state, the organ may still be replaced without difficulty, especially when the prolapse has followed soon after delivery at the full period, the pelvic floor being sufficiently yielding in most instances. In the course of a variable duration of time, a partial descent is often followed by a complete protrusion of the organ, "the vagina becoming inverted, and forming the outer walls of a tumour, at the lower part of which the womb is situated. So long as the procidentia is incomplete, this tumour is somewhat pyriform in shape, its base being directed upwards; but afterwards, as it increases in size, it assumes an oval form, owing to more or less of the bladder being drawn down into it in front, and of the rectum also, in many cases, behind. Its bulk is also further swelled, in numerous instances, by the small intestines sinking down into the sac, and thus adding to its size until it equals or exceeds that of the adult head."

132. In these cases, the uterus itself forms only a comparatively small portion of the large external tumour. The susceptibility of the organ, and the disposition to hypertrophy, are much diminished by constant and complete prolapsus from the pelvic cavity. "The bulk of the tumour, and the difficulty of its replacement, depend chiefly upon two causes. Of these, the one consists in the enormous hypertrophy which the vaginal walls undergo. Not only does their mucous membrane lose its ordinary character and become covered by a layer of cuticle like that of the skin, to protect it from the various sources of irritation to which it now becomes exposed, but the walls themselves attain a thickness of as much as half an inch, and present a dense muscular structure.

The other cause of the bulk of the tumour, and of the difficulty of replacing it, arises from the presence of the intestines in the sac, which seldom reside there long without inflammation of their peritoneal covering being set up; not of so acute a character, indeed, as to produce formidable symptoms, nor even as always to call for treatment, but matting their different coils to each other, and tying them firmly to the interior of the sac." This latter cause of difficulty in attempting to return a long procident uterus, should not be overlooked, for, even though no intestines have descended into the external tumour itself, chronic peritoneal inflammation may agglutinate them to each other, or to the walls of the pelvic cavity, and thus oppose the replacement of the womb.

133. *B. The symptoms of prolapse of the uterus.* —The symptoms may be severe in some cases, and hardly experienced in others. In the unmarried, and when occurring suddenly or rapidly, prolapse of the uterus is attended by much more severe or acute symptoms than when it occurs in married females after miscarriage or delivery, or when it takes place slowly. When it is caused in single females after prolonged dancing or riding on horseback, the symptoms are generally rapid and severe; and even in married females who have borne children, and have subjected themselves to these causes, the descent is usually rapid, and the symptoms are also severe, but the prolapse is generally greater than in the single. The sensation most frequently experienced is that termed "bearing down," or of falling down of the pelvic viscera. This feeling is augmented by lifting weights, or by bodily exertion; and then it is often attended by a sharp pain. Defæcation is difficult and painful, and is followed by some degree of tenesmus. Pain in the direction of the vagina, when sitting down, especially on a hard seat, pain in the back and low in the sacrum, and a very frequent desire to pass water, are always experienced. Leucorrhœa is often complained of, and the catamenia are either profuse, prolonged, or too frequent. The digestive organs are soon after more or less disordered, the bowels are constipated, and the general health suffers; and as the prolapse becomes chronic or prolonged, the cervix and even the body of the uterus become hypertrophied.

134. External prolapse, or procidentia uteri, generally follows the internal prolapse, or that in which the uterus and cervix still remain within the external parts; and usually takes place gradually. It is favoured by emaciation or the absorption of the adipose substance in the vicinity of the vulva; and it occurs most frequently after a too early change of position after parturition or miscarriage, or too early exertion, or walking about, after these occurrences. In these circumstances especially, sudden, unusual, or great exertion, or straining at stool, or lifting weights, may occasion procidentia suddenly; and the symptoms may then be severe. As the cervix, the lower part, and the body of the organ, successively protrude, — the former parts only occasionally at first, — the pains, inconvenience, and distress increase, and ultimately the whole organ lies nearly always or constantly without the external parts. After the protrusion, the sensibilities of the uterus become blunted by the exposure, and the vaginal leucorrhœa subsides. But, as the procidentia increases, the relations of the uterus with the adjoining organs and parts are changed. The urinary bladder and urethra are more particularly implicated, occasioning dysuria, a frequent desire to empty the bladder, or incontinence of urine. The rectum is also affected so as to render defæcation difficult or painful; whilst the descent of the small intestines into the pelvic cavity, and the excoriations, thickening, irritation and ulcerations of the exposed parts, owing to exposure to the air, and to the dribbling of urine, and to other contingent occurrences, increase the sufferings of the patient. With the complete prolapsus, hypertrophy of the organ increases, more especially its cervix and the lips of the os tincæ, which, moreover, become ulcerated to a considerable extent, the cavity of the cervix being drawn apart, so as to become open or gaping, the ulcerations extending into it. In many cases of internal prolapse, pregnancy takes place; but this period is often one of considerable suffering. If the prolapse be slight, pregnancy generally cures it, as the uterus rises in the pelvis with the advance of gestation, especially if care be taken, and the patient remains in a recumbent position long after delivery. When the uterus is either *partly* or *altogether* external, impregnation rarely takes place. In the former case, the sufferings of the patient are greatly increased by impregnation; and miscarriage usually takes place, the organ being unable to rise into the pelvic and abdominal cavities. "In some few instances, however, pregnancy runs its course undisturbed, in spite of a great degree of prolapsus; and cases are on record in which the uterus has descended further and further, until a great portion of it hung down between the thighs; but the developement of the fœtus has, nevertheless, gone on in this unnatural position; and others still stranger, in which coitus has been practised immediately through the os uteri, and impregnation and undisturbed gestation have followed in spite of the existence of irreducible procidentia." (WEST, *Lect.* p. 172.)

135. *C. Treatment.*—The causes which tend to oppose the return of any long existing procidentia of the uterus, have been explained above (§ 132.); and the same causes, although operating in a less degree in simple or internal prolapsus, often prevent the complete restoration of the womb to its normal position. The first object, in respect of treatment, is, to ascertain the causes of prolapse, and the circumstances connected with its occurrence and progress; for the means of cure or of palliation must be directed accordingly. Carefully avoiding the causes of prolapse (§ 126. *et seq.*), the patient should strictly observe rest and the recumbent posture; preserve a gently open state of the bowels, and have recourse to astringent injections, and the cold hip-bath. When the womb is much enlarged, as well as prolapsed, the measures advised above for the enlargement (§§ 115—120.), should be adapted to the peculiarities of the case. It should be recollected that there is always a tendency to a return of the descent, even when the womb has regained its proper position, upon the recurrence of the menstrual period. If, therefore, due care and proper precautions be not taken on the accession and during the course of this period, the descent may return; and each return will be attended by an

aggravation not only of the extent of the prolapse, but also of the enlargement of the organ, and of the profuse menstruation which generally attends it; especially if the patient be allowed to remain in an erect or sitting posture.

136. As respects a recourse to mechanical supports in order to preserve the uterus in situ, as well as regards a selection of those supports, I must refer the reader to directions contained in Dr. WEST's very able and instructive Lectures, and be contented with a reference to the more general principles and directions he has there adduced: — 1st, In cases of slight descent of the uterus, resulting from a general loss of tone in the parts, or from some temporary or accidental cause, as excessive fatigue, over-exertion; 2d, In cases where the descent of the womb is still comparatively recent, and is due to the persistence of puerperal hypertrophy owing to imperfect involution of the organ (§ 69.) after abortion or labour; 3d, In cases where uterine disease, of whatever kind, was the occasion of displacement of the organ, such disease being still in a stage requiring treatment. In these several circumstances, mechanical support of the uterus is not necessary or suitable. On the other hand, mechanical means of some kind or other are required,—1st, In all cases of external prolapse or procidentia; 2d, In cases of long standing prolapse of the second degree, associated with much relaxation of the vagina, and consequent weakening of the uterine supports; 3d, In all cases of extensive laceration of the perineum, and for a similar reason in cases of prolapsus in the aged; 4th, In cases of less degrees of prolapse attended by extreme suffering; 5th, In all cases of considerable prolapse of the vagina, with or without descent of the rectum or bladder, and in all cases in which the uterine prolapse is secondary to any of those other forms of displacement. It is unnecessary here to describe the several kinds of support or contrivances which have been advised. They are either external or internal, according to the manner of their employment. They are well described in Dr. WEST's work just referred to, where very judicious directions are also given for their use.

137. These contrivances for the relief of prolapsus of the uterus or vagina, are merely palliative; they bring about, however, a cure in some cases, by preventing any increase of the displacements, and by giving time for nature gradually to remove them, more especially in slight or recent cases. But in cases of long standing, and in those in which the descent is considerable or complete, there is much uncertainty in their results. Therefore operations have been devised for contracting the orifice of the vulva, and the prevention by such means of external prolapse. In cases of lacerated perinæum, the restoration of this part by an operation is obviously the most successful mode of curing a prolapse; and it has been often successfully attempted. But in cases where the orifice of the vulva is relaxed, or is widened by the uterine descent, means have been taken by Dr. FRICKE, Mr. BROWN, M. GERARDIN, M. LANOIN, and Dr. KENNEDY, for its contraction, with various degrees of success. These means will readily suggest themselves to most medical men. A further notice of them does not fall within the scope of this work.

138. ii. ASCENT OF THE UTERUS.—This state of displacement deserves notice only in as far as it is of some importance as a symptom; — 1st, of advanced pregnancy, from the fourth to the eighth month; — 2d, of some cases of inflammation of the pelvic cellular tissue, or of the tissues between the folds of the broad ligaments; — 3d, of an advanced stage of inflammation or of dropsy of the ovaria; — 4th, Of fibrous or other tumours of the uterus when they increase in size and draw the uterus upwards; — and 5th, A great degree of contraction of the pelvis.

139. iii. OF OTHER DISPLACEMENTS AND DEVIATIONS OF THE UTERUS. — The displacements of the uterus which consist of *versions* and *flections*, or, strictly speaking, of *deviations of the body and neck of the organ* from their normal position, have only recently received due attention; and, although descent of the womb, in its several degrees, has been duly considered, owing to the prominent manner in which it is brought before those who have professed the study of the extensive class of female diseases, yet other deviations of the womb from its natural position have been, until lately, but imperfectly investigated by them, in the married and child-bearing states, and entirely neglected in unmarried females. This neglect has in great measure originated in imperfect knowledge, or entire ignorance, — 1st, of the probability of the displacement being congenital: — and 2nd, of certain of the causes of these deviations, especially those causes which more frequently occur in unmarried than in married females, and to which I have sufficiently adverted already (see §§ 10. 22.).

140. *A.* Dr. W. HUNTER first directed attention to *retroversion* of the uterus as sometimes taking place in the early months of pregnancy; but it was not recognised as occurring in the unimpregnated womb until cases of it in this state were published by Professor OSIANDER in 1808, and Professors SCHWEIGHAEUSER, in 1817, and SCHMITT, in 1820, further illustrated the history and symptoms of this displacement. More recently, Professor SIMPSON of Edinburgh, and M. VELPEAU, have fully investigated the nature and signs of the several deviations of the unimpregnated uterus from the normal state. Not only may the fundus of the womb fall backwards into the hollow of the sacrum, or forwards against the symphysis pubis, but it may also incline towards either side. Its body may, moreover, be bent upon the cervix, forming a new class of deviations, called flections; and Dr. WEST states that there is reason for believing that *retroflection* and *anteflection* are of more frequent occurrence than the corresponding alterations in position of the whole of the organ, which are known as *retroversion* and *anteversion*. The tendency of the womb, when at all enlarged, either in the early period of pregnancy, or by disease, is not only to sink below its natural position, but at the same time to fall back with its fundus towards the hollow of the sacrum; besides, enlargement of the organ either from imperfect involution, or from disease, is generally most considerable at its posterior parietes, thereby causing a tendency to fall towards the heavier side. The distention of the bladder also, so frequently continued for a prolonged period, and a loaded and constipated state of the bowels, aid in producing this form of deviation, whether in the gravid or in the non-

gravid uterus; whilst sudden efforts, or violent exertions, falls, concussions of the trunk, will concur with these and other causes or circumstances, as with the catamenial period in the non-gravid, in producing this form of deviation, namely, *retroversion*. Previous delivery, miscarriages, difficult menstruation, congestion of the uterus, intemperate sexual indulgence, and increased determination of blood to the organ, will also predispose to, or even cause, this occurrence, as well as some other conditions hereafter to be noticed (§ 142. *et seq.*).

141. *B. Anteversion* of the non-impregnated uterus was, only a few years ago, considered to be a rare occurrence. I find in the notes of a case, which I saw with Mr. HOYLAND, in 1843, that I remarked that one to have been only the fourth that I had seen, and that this case was most probably owing to adhesions of the fundus of the uterus, as the lady had been some considerable time previously the subject of pelvic peritonitis. Madame BOVIN had, however, many years previously pointed out attacks of circumscribed peritonitis as a not infrequent cause of abortion. Without such adhesions it is difficult to account for the occurrence of anteversion, owing to the relative position of parts; and there is much reason for inferring, with Dr. WEST, that many of the cases believed to be those of *anteversion* were actually cases of *anteflection*, the fundus of the organ having been bent forwards on its cervix. But even in this case, the explanation of its occurrence is not easy. In married females, however, some allowance should be made for the mechanical effects of sexual intercourse in connection with the venereal orgasm in the female.

142. *C.* As respects the deviations usually termed *version* and *flection*, Dr. WEST remarks "that in the greater number of cases of alleged version of the womb, either forwards or backwards, the organ is really flexed or bent upon itself; and further, that not infrequently the two conditions co-exist, the whole womb being thrown more forwards or more backwards than natural, while in addition the body of the organ is bent upon its cervix." As far as the symptoms are concerned to which they give rise, these varieties of deviation present but little difference.

143. As to the point of *flexion of the uterus*, whether backwards or forwards, Dr. WEST agrees with Professor VIRCHOW of Berlin, in considering it to be the junction between the body and neck of the womb, or, in other words, the spot corresponding to the internal os uteri; and that the flection is owing to the anatomical fact, that, while the neck of the womb is firmly connected with the posterior and lower part of the bladder, its body is perfectly moveable. As to the comparative frequency of the two forms of deviation, Dr. WEST states that his notes furnish the particulars of twenty-six cases of retroversion and retroflection, and of nine of anteversion and anteflection. M. VALLEIX, however, gives thirty-five deviations of the uterus forwards, and thirty-three backwards; and Dr. MAYER, of Berlin, sixty-three cases of the former, and sixty-four of the latter. The frequency of adhesions, and of other indications of previous inflammation, as a cause of deviations of the uterus, is shown by the statement of Dr. WEST, that he met with these lesions of the womb, its appendages, and the vicinity, in twenty-two out of sixty-six cases, in which he examined the uteri of women who had died of some other than uterine disease.

144. Protracted flexion of the uterus may be expected to be followed by further lesions. These are narrowing of its cavity, at the point of flexion especially, and atrophy of the parietes of the womb on the side towards which the flexion occurs, thereby rendering it permanent.

145. The cervix is very generally more or less diseased in all the forms of deviation of the uterus, presenting the several states of lesion described above as being seated in the cervix externally and internally — these being chiefly indicative of inflammatory irritation or action, granulations, excoriations, ulcerations, enlargement of the cervix, and an open or gaping state of the os and cervical cavity, enlargement of the posterior lip of the cervix, &c. (see § 27. *et seq.*); these severally, or two or more of them jointly, being very frequent *complications* of deviations of the uterus from the normal state. That these lesions of the cervix are not always consequences of the deviations, my experience induces me to believe, and to infer that Dr. H. BENNET more correctly attributes the deviations to pre-existing disease of the cervix. It appears to me that those alterations of sensibility of the cervix associated with more or less irritation or chronic inflammatory action, and with the several consequences of sexual excitement, leucorrhœal discharges, disordered menstruation, and their numerous and ever-varying sympathetic affections, are more likely to give rise to deviations of the position of the uterus, and not only to the deviations already noticed, but also to others, consisting of obliquity of position, or to *lateral deviations* (which I believe to be the most frequent of any, and to be generally of temporary duration), when unconnected with disease of the ovaria and the broad ligaments, than that these deviations of the womb from its natural position should occasion disease of the cervix. It may be readily allowed that any pre-existing disease in this part may be aggravated by lesions of position; but that the former is a consequence of the latter, requires further proof; and the positive evidence furnished of a different succession of lesions would require to be previously disproved.

146. *D. The symptoms of deviations of the uterus* have been subjects of contention even with those who have taken female diseases under their special protection. How, therefore, shall those who get only occasional glimpses of uterine diseases decide, when so very opposite views are entertained by the professors of this speciality? The former are, however, the judges in the cause; the latter are the partisans or advocates of their respective doctrines. Thus it is stated, by a very recent and able writer on these diseases, that "the symptoms are by some described as being both numerous and characteristic, and the appropriate treatment is by them alleged to be both simple, safe, and successful, while others deny that the mal-positions, taken by themselves, produce any symptoms, and assert that the proposed treatment, while attended by very considerable risk, is wholly inadequate to the removal of the evil which it is intended to cure. Each of these opinions, too, is maintained by men equal in the eminence of their position, in their practical

experience, and in their good faith." (*Op. cit.* p. 206.) This statement is borne out by the discussion on this subject reported in the "*Bulletin de l'Académie de Médecine*" for 1853-4 (vol. xix. pp. 778—976.), and is there fully and remarkably illustrated.

147. It is very obvious to the student of human nature, that, however well informed individuals may be in their especial department, and however eminent in popular estimation, as long as occurrences, morbid actions, and their consequences, vary so as to give rise to modified or different signs, phenomena, or symptoms, and to develope modified or altered features or aspects, so long will the observers of these see and believe certain of them in preference to, or to the neglect of, the rest, and thus form one-sided views, which the very majesty of their position, in either professional or popular opinion, or both, will not admit of being impugned, and for which they will contend with biassed judgments, even in opposition to the most obvious truths. Now, as one of the professed judges in such matters, and having no preconceived opinions as regards them, I venture to state, that the symptoms vary, in severity and number, with the causes — predisposing and exciting, — with the sensibility and irritability of the sexual organs themselves, and of the constitution, with the existing deviation and its extent, with its several associations with disease of the cervix and its consequences, with the states of the natural and morbid uterine discharges, and with the several complications which deviations of the uterus present with the adjoining viscera. Hence it may be inferred, that the slighter deviations, which have taken place slowly or gradually, in females evincing but little susceptibility or irritability, and which are not associated with marked disease of any part of the uterus, or of structures connected with it, may not occasion any disorder calculated to excite anxiety in the patient, or to require medical advice, and yet may exist for a long period, or may disappear altogether, from the efforts of nature or from changes in the female economy or in the constitution. But deviations of the uterus to a considerable extent, especially when occurring suddenly from well-recognised causes, and when associated with other uterine lesions, or with diseases of adjoining parts, — and even when existing simply in susceptible, sensitive or irritable females, married or unmarried, more especially in the latter when masturbation is suspected, — then will very generally occasion symptoms which, if they do not prove, should at least induce the physician to ascertain its existence or non-existence by an examination. That the symptoms are often, however, more or less equivocal, or that they may frequently accompany other lesions of the womb, must be admitted, but a vaginal examination readily solves the difficulty, and evinces the true nature of the complaint. The symptoms usually present in uterine displacements or deviations are, excessive, painful or difficult menstruation, leucorrhœal discharge, pain in the pelvis generally, and most severe in that part of the pelvis towards which the fundus uteri is turned or flexed, pain and difficulty in defæcation and micturition, constipation, frequent calls to pass urine, or sometimes retention of it, and sterility. According to the temperament and habit of body of the patient, various sympathetic disorders may be induced by uterine deviations, chiefly affections of the digestive organs, as nausea or retchings on the accession of the catamenia, hysterical symptoms, pain under or in the mammæ or in the spine, neuralgic pains in the limbs, &c.

148. As respects this disputed question, Dr. West justly remarks that, although cases prove, on the one hand, that flexions of the womb do not, of necessity, give rise to any distress, and, on the other, that the removal of a flexion of the organ may not be followed by relief of the patient's sufferings, the fact still remains, that displacement of the womb is in very many instances attended by various uterine ailments not experienced before its occurrence. Here, however, the question suggests itself, — Are the sufferings of the patient due simply to the displacement, or to the morbid condition with which the displacement is associated, or to the two causes conjoined? Dr. West answers this question by stating that "there are circumstances which appear to favour the opinion, that, in the majority of instances, the symptoms are due not to displacement alone, but to displacement accompanied by some other morbid state of the womb." This opinion is confirmatory of that previously given by Dr. H. Bennet, that the deviation is nearly always a consequence of chronic inflammation of the cervix, is associated with the cervical disease to which the sufferings of the patient are mainly due, unless in extreme cases of displacement. For some remarks on the diagnosis of versions and flexions of the uterus, and on the use of Dr. Simpson's uterine sound for this purpose, I must refer the reader to Dr. West's lectures, and to the other recent works on uterine disease. There can, however, be but little difficulty in the diagnosis between such deviations and tumours in the uterus, for which they can hardly be mistaken.

149. E. *The treatment of deviations of the uterus* has been a matter of dispute among modern authorities on uterine diseases. Certain of these contend, that the lesions of the uterus to which the deviations are due, and to which the symptoms are chiefly owing, should be made the objects of treatment, whilst others attempt to restore the uterus to its right position, and to maintain it there by mechanical contrivances. Schweighauser, Schmitt, Oldham, and others, have supported the former treatment, whilst Dr. Simpson, Velpeau, Kiwisch, and Valleix, have resorted to the latter. These contrivances have undergone various alterations in the hands of the several authorities who have had recourse to them. From what I have seen of cases in which they were employed[*], and from the opinions of M. Dubois and Professor Scanzoni, as stated by Dr. West, I believe that, although they may be successful in some

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[*] In two of unmarried females who had previously consulted me for hysteria with leucorrhœa, the mechanical contrivance in question was resorted to by the physicians to whom they had subsequently confided their treatment. I was requested by the parents of these two young females to see them in consultation with the physicians then attending them, their parents having been dissatisfied with this treatment. The contrivances in use for them were shown me; their appliance and object were manifest. The patients, themselves, were in favour of the treatment: but their general health appeared much impaired since they were my patients. I stated to the parents that I could not approve of the means employed for single females; that the contrivances could not be always applied, and that the complaint would return when they were relinquished. I therefore refused any further interference in these cases.

cases, under the care of able and careful practitioners, they are attended by no small risk, as respects the uterus, its appendages, and peritoneum; and that the return of the displacement is very frequent after the mechanical contrivance is removed. At a recent discussion in the Academy of Medicine at Paris, "M. Dubois stated that he had himself treated upwards of twenty cases by means of the uterine supporter, which in some instances was worn for several months, but that the displacement reproduced itself within a very short time after the removal of the instrument; and that he had made a similar observation in the case of many patients who, having been thus treated by M. Valleix and Dr. Simpson, had been dismissed by those gentlemen as cured." Professor Scanzoni remarks that "the observation of fifty-six cases of flexion of the uterus during the past four years, compels me to express my decided conviction that the mechanical treatment of this affection is either useless or positively mischievous." He concludes that, having quite discontinued the use of these mechanical contrivances, and contented himself with a recourse to cold vaginal injections, with the antiphlogistic treatment of any chronic uterine inflammation, and the application of caustic to any ulceration of the os uteri, and with the endeavour to remove the chlorotic symptoms which are seldom absent, he has been much better satisfied with the results of treatment than he was when he was seduced into the application of a variety of mechanical contrivances. (*Lect.*, &c., p. 225.)

150. It is obvious from the foregoing, as well as from my own limited experience, that attention to the improvement of the general health, to the removal of the local lesions of the uterus with which displacement is often associated, as they admit of removal by local and constitutional treatment, to alleviation of the more painful or distressing symptoms, and to the improvement of the secretions and excretions, are the true principles which should guide the physician in the management of these complaints. The means which are chiefly required are such as have already been recommended. If the catamenia be excessive, the sulphuric acid and sulphate of magnesia, or the supertartrate of potash, if the bowels be constipated; the sulphate of alum if this state do not exist, or the gallic acid, tannin, or the infusion of matico, may be prescribed internally, and conjoined with henbane, or with conium, or with the extract or tincture of belladonna, or of the Indian hemp, if pain be urgent. After the second or third day, if the discharge be excessive, cold enemata may be administered twice daily; and in order to remove the anæmia and debility generally characterising these cases, chalybeate preparations, variously combined, according to the circumstances of the case, should be given, and the diet and regimen strictly enforced.

151. VI. Inversion of the Uterus—*the turning of the organ inside out*—is clearly impossible in the unimpregnated healthy womb. It is one of the most grievous and fatal accidents which can befal a female. My late friend Dr. Crosse of Norwich, in his elaborate essay on Inversion of the Uterus, states that, of 400 cases of inversion, of which he had found mention, 350 were consequences of parturition. Of the remaining 50 cases, 40 were said to have occurred from the presence of a polypus in the interior of the womb, the accident taking place either spontaneously or from traction in attempting to remove the growth. Enlargement of the uterine cavity, associated with some cause exciting contraction of its fibres, are the conditions essential to inversion of the organ.

152. *A. The symptoms* of inversion of the uterus are, sudden collapse or sinking, with abundant hæmorrhage, with disappearance of the tumour formed by the uterus in the abdomen, and the presence of a large spherical body either just within the vagina, or projecting beyond the external parts. My friend Dr. Radford has, however, shown that, except in cases where the placenta still partially adheres to the uterus, the hæmorrhage is not so formidable as might be anticipated; and that the shock to the system is in great degree independent of the loss of blood.

153. *B.* Inversion of the uterus is *caused* chiefly by the detachment of the placenta after delivery, owing to undue force or want of care; and, in rarer cases, by a spontaneous and unequal or irregular contraction of the uterus, either whilst throwing off the placenta, or even soon after or upon the detachment of it, whilst the cervix and os uteri are at the same time comparatively relaxed. This explanation of spontaneous inversion of the womb was ably given by Dr. Radford and confirmed by Dr. Simpson. The pressure of the bowels on the fundus caused by the action of the abdominal muscles during the detachment of the placenta may also favour this occurrence. A polypus or tumour firmly attached to the interior of the fundus uteri, having descended through the os uteri, may likewise excite irregular action and drag the fundus with it, thereby producing, with varying degrees of rapidity, inversion of the organ.

154. In most instances the inverted uterus becomes speedily firmly contracted; but in a few cases, the uterus remains soft and flaccid, and even capable of replacement. The hæmorrhage often continues at short and uncertain intervals, and in very variable quantity from the period of the accident, but to this there are occasional exceptions. The consequences of inverted uterus tend with varying degrees of rapidity to the destruction of life,—at least in the great majority of instances. Dr. Crosse states "that in 72 out of 109 fatal cases, death took place within a few hours, in 8 within a week, and in 6 more within four weeks. The immediate danger, however, being surmounted, there follows during lactation an interval of comparative safety and of cessation of serious symptoms, which reappear when suckling is over. It appears that of the remaining twenty-three patients only one died at the fifth month, and then, as the result of an operation which had an unsuccessful issue; one died at eight months, three at nine months, and the others at various periods of from one to twenty years."

155. *C.* The *diagnosis* of inversion may be overlooked or mistaken. The inverted uterus has even been torn away by ignorant persons who had believed it to be the placenta. Dr. Crosse considered that the womb may be partially inverted spontaneously a short time after the detachment of the placenta, or *depressed* at its fundus. This may increase to *introversion;* but the partial in-

version, although attended by much vital depression and hæmorrhage, will not occasion any tumour in the vagina, nor a complete disappearance of that formed by the uterus in the abdomen. Introversion of the uterus may, however, soon pass into *complete inversion*. An inverted uterus may be mistaken for polypus, and a fatal issue result, as indeed it has resulted, from this error. The history of the case generally will assist the diagnosis, but polypus may complicate pregnancy, and may occasion both a tumour after delivery and hæmorrhage. The firm constriction of the os uteri upon the cervix of an inverted womb causes the part to assume the form of a pedicle, thereby rendering the diagnosis more difficult, unless an examination be made *per rectum*, when the uterus, if inverted, will not be found in its place, whilst if the vaginal tumour be a polypus it will be found in its proper place, and probably also somewhat enlarged. The uterine sound, as improved by Dr. Simpson, will also aid the diagnosis, if properly used.

156. D. The *treatment* of inverted uterus is attended by great difficulty. If the accident occur before the detachment of the placenta, the removal of this body should be effected before the replacement of the uterus be attempted. Dr. Simpson's accurate views as to the source of hæmorrhage in parturition show that fears of serious bleeding in consequence of the removal of the placenta in these cases need not be entertained. Two modes of returning the uterus when inverted after labour have been recommended. The one by pushing back or indenting the inverted fundus with the finger; the other by grasping the womb between the fingers, compressing it, and by pushing it upwards into its proper situation. Either of these modes may succeed in recent cases occurring after delivery, whilst the organ is soft or flaccid, or as long after as it may remain in this lax state. In these cases, as well as in others, in which the replacement is attempted either when the organ is more firmly contracted, or when some time has elapsed from the occurrence of the accident, chloroform may be found of use in facilitating the operation, although in some cases where this substance has been employed, no advantage was procured from it.

If the inverted womb cannot be replaced, immediately after the occurrence of the inversion, it will remain irreducible and entail on the patient all the miseries and perils incidental to this state. The only means of averting these are by operations, which are attended by very serious hazards. The chief reasons which can be urged for such operations — the removal of the inverted organ by the knife or by ligature — are profuse hæmorrhages or discharges endangering the patient's life. Dr. West has given the following table of the results in 50 cases of inversion of the uterus after delivery, in which extirpation of the organ was performed.

	Cases.	Recovered.	Died.	Operation Abandoned.
Uterus removed by ligature - -	38	28	8	2
Uterus removed by the knife - -	4	3	1	
Uterus removed by knife and ligature	8	5	3	
	50	36	12	2

157. It is of importance to know the results of extirpation at different periods from the time at which the inversion occurred. If the operation be performed soon after the occurrence of the accident it cannot be expected to be as successful as at a remote period from the occurrence, as the organ will diminish in size, vascularity, and sensibility by the lapse of time. Accordingly we find that, of 21 cases thus operated upon within twelve months from the occurrence of the accident, 9 died and 12 recovered, whilst of 25 cases in which the operation was not performed until one year or much longer periods had elapsed, 23 recovered, and only 2 died. Of the occurrence of inversion from a polypus, and of the various modes and appliances for extirpating the uterus I must refer the reader to works on surgery, and to those enumerated in the Bibliography and References to this Article.

158. VII. Of Polypi of the Uterus.—Polypi and tumours of the womb generally occur during the period of sexual activity, or, if they be developed at a somewhat later period, or soon after the climacteric period, they have generally originated some time previous to it. It is often very difficult to ascertain the *causes* which either *predispose* to or *excite* their formation; but there is reason to infer that inordinate excitement or determination of blood to the uterus, with a disposition to hypertrophy of one or more of the tissues of the organ, are the chief causes of these lesions.

159. i. *Mucous polypi* or excrescences from the folds of the *arbor vitæ*, are often met with, varying from a third of an inch to nearly an inch in length to about three or four lines in thickness: they are connected with the mucous or villous membrane of the canal of the cervix, by a very slender and short pedicle. They are usually of a bright rose tint, are supplied with a delicate net-work of vessels, and consist of mucous membrane with a small admixture of cellular tissue internally. They may spring from any part of the cervical canal; but they more frequently arise nearer to the external than to the internal os uteri. Although generally pediculated, they are sometimes sessile, and in rare cases they seem as hypertrophied folds of the arbor vitæ. These productions are either single or multiple, two or three existing in the same patient; and having been removed, they may be reproduced in a few months afterwards. They may even coexist with fibrous tumours of the uterus. Dr. Montgomery, of Dublin, believes them to be sometimes precursors of malignant disease; and this was observed in one case which was under my care. In rarer instances these polypi are much larger than now stated, and consist of a cellular or fibro-cellular tissue invested by mucous membrane; sometimes they reach the size of a fig, are flattened, and hang down beyond the os uteri into the vagina.

160. ii. *Follicular polypi*, or polypi from enlargement of the follicles of the cervix, are not infrequently observed. They appear as *cysts*, of the size of a pea, imbedded between the folds of the arbor vitæ, and hardly projecting beyond the level of the canal. They are, however, sometimes much larger, are more or less numerous, and are distended by albuminous matter. When

arge and numerous, they cause the absorption of the cervical structure, and even occasion the bulging outwards of the structure of the cervix.

161. iii. *Complex polypi*, consisting of mucous follicles, the mucous or villous surface, and fibro-cellular tissue of the cervical canal, are more frequently seen, than either of the foregoing. These polypi are either pediculated, the pedicles being sometimes of considerable length, more rarely very short, or appear as continuous tumours or growths from the inner surface of one or other of the lips of the os. When divided they are found to contain a tenacious, transparent, albuminous matter, identical with that secreted by the Nabothian glands. When small they consist chiefly of cysts filled with this matter. When they are much larger, and reach the size of the first joint of the thumb, these cysts or vesicles are not so distinct, but exist in the form of canals, arranged longitudinally, between which a fibro-cellular tissue enters more or less abundantly. Their surface often presents an uneven or tubulated appearance, is generally not very vascular, and is composed, according to Virchow, of a dense cellular tissue, covered by a thick layer of tasselated epithelium.

162. iv. *The symptoms* indicating the existence of polypi generally appear gradually, and may with increasing severity continue months or even years before medical aid is required. There are usually at first leucorrhœal discharge, hæmorrhage, or both, followed by bearing down pains in most cases. When the polypi are very small, they may produce either very slight symptoms or no symptoms at all. Hæmorrhage is, however, very generally experienced, especially when the polypi occasion enlargement of the neck of the womb. The size of the polypus may not influence the hæmorrhage, a small one often causing more than a large one. Dr. West considers that the structure of the polypus influences the symptoms, and that those polypi which present the compound structure due to the enlargement of the Nabothian glands are always productive of profuse leucorrhœa; and their vascularity of surface being less, they are less frequently the occasion of hæmorrhage. The much rarer occurrence of follicular polypi, is attended by a profuse albuminous discharge, and is not associated with profuse menorrhagia, unless in rare instances. The symptoms now mentioned should always suggest digital examinations, and if no polypus can be felt, examination by the speculum becomes requisite.

163. v. *The treatment* of polypi is thus described by Dr. West. "The smallest may be removed by laying hold of them with a pair of long forceps and twisting them off, while those which are somewhat larger, after being twisted to check the risk of bleeding, may be cut off by a pair of scissors. The bi-valve speculum should always be employed in doing this, and both forceps and scissors are made for the purpose, so constructed as to be readily worked within the speculum." For the sessile growths or tumours, noticed above (§ 159.), he applies the acid nitrate of mercury, which destroys them, and arrests the bleeding. As respects the removal of larger polypi and the several means of accomplishing it, I must refer the reader to the work just quoted, or to the surgical works where this operation is fully described.

164. VIII. Fibrous Polypi or Tumours within the Uterus are amongst the most serious organic diseases of the uterus, and the least amenable to treatment. They are uncertain in their rates of progress, being in some cases rapid, and in others slow; and in rarer instances almost altogether cured by the efforts of nature, which either throws off the morbid structure from the organ in which it is seated, or stops its growth. These tumours vary much in structure and in their seat. When they arise from the internal surface of the uterus, or underneath the internal membrane, they are generally considered as a form of polypus, and described as such, — as *fibrous polypus* of the uterus. Dr. West considers them to be fibrous tumours, growing from the inner surface of the womb, or less frequently from either lip of the os uteri.

165. *A. Fibrous polypus of the uterus* is nearly identical with other fibrous tumours of the organ; and differ chiefly either in being developed immediately underneath the internal membrane, or in having more or less of the fibrous structure of the womb interwoven with or covering it. Fibrous polypus of the uterus is pediculated, and, growing from the interior of the womb, is more vascular than other tumours of the organ. The pedicle is composed of uterine fibres mingled with more or less dense cellular tissue. A layer of uterine substance is continued a short distance from the pedicle along the tumour, in some cases, or invests it in part, or altogether in others. In addition, the polypus is always covered by the internal membrane of the uterus, which becomes firmer and denser than natural, both it and the fibres of the womb being developed with the growth of the tumour. These tumours are generally single, but they are sometimes double, very rarely more numerous. They are of very different sizes, and occasionally remarkably large. They may, in some instances, be enucleated from their coverings; in others, their substance is intimately connected with their envelopes. The vascular supply of these tumours through their pedicles, is generally small in proportion to their size and to the quantity of blood in their substance. This comparatively small supply of blood, the profuse hæmorrhages they occasion, and the arrest of the hæmorrhage by ligatures around their pedicles, have rendered it very difficult to determine the actual source of hæmorrhage. Dr. West seems to believe that it is rather from the irritated mucous membrane of the uterus than from the surface of the tumour itself that the bleeding flows; and a variety of considerations confirm this opinion.

166. These polypi being generally formed within the uterus, influence the organ in some respects, according to the situation whence they spring. If they arise low down, or in the cervical canal, the tumour soon grows beyond these limits, and, passing down into the vagina, may acquire a considerable size, without disturbing the uterine functions. If they arise from some part high up, or near the fundus of the uterus, they often remain until they have acquired a great size, occasioning enlargement of the organ and thickening of its walls, as in pregnancy. But in many cases, before or soon after the tumour has reached the size of an orange, the os uteri gradually dilates, allows its passage through it, and embraces

its pedicle. In some cases this result takes place without much suffering; but in others, violent uterine action is excited by the tumour, which recurs at intervals, and resembles the pains of labour. The tumour, or polypus, is thereby extruded from the uterus, into the vagina; and the irregular contractions of the uterus, especially when the polypus is firmly attached near the fundus, may drag down, or invert the organs, as stated above (§ 151.). Generally the polypus is detected soon after it has passed into the vagina; but if not detected, and when allowed to remain in this situation, it acquires a large size. I believe, however, that the largest tumours of this kind reach their full size within the uterus. In a case which came before me, and in which Dr. Lee was consulted, two tumours were thrown off of the size of between two and three pounds each, immediately after passing the os uteri.

167. Fibrous polypi may present œdema of their substance, extravasation of blood into their structure; and having passed into the vagina they may undergo ulceration, especially if air come in contact with them, or even sloughing. When they are detached spontaneously, or by means which produce firm contractions of the uterus, as in two cases where this was effected by the treatment which I adoptod, their pedicles give way, and the whole mass (fibrous structure and envelopes) is thrown off.

168. *B. The Symptoms* of fibrous polypi are nearly the same as mentioned above (§ 162.) — are leucorrhœa, hæmorrhage, and bearing down. The hæmorrhage is at first experienced chiefly at the menstrual periods which are prolonged, or return at shorter intervals, or are more abundant, approaching to flooding, leucorrhœa being present in the intervals. Bearing down is almost constant in some cases, or recurrent in others, with expulsive pains or efforts, when the tumour has far advanced. When these symptoms are present, a vaginal examination should not be delayed. If the polypus have not passed the os uteri, the *diagnosis* becomes very difficult. In these circumstances the uterine sound, as advised by Professor Simpson, or dilatation of the os uteri by the sponge tent, as recommended by the same eminent authority, becomes necessary.

169. *C. The Treatment* of fibrous polypi has always hitherto been considered as entirely instrumental or surgical. In two cases which I treated, the means employed were strictly medical and proved in both, within a few hours, successful, the tumours having been extruded through the os uteri by the action of the uterus and entirely thrown off. In one of these cases the hæmorrhage was excessive. I prescribed immediately the biborate of soda in solution, and directed the dose, about six grains, to be repeated every hour or two. A tumour, about the size of a child's head, was soon after thrown off; six or seven doses of the borax having been taken, when vomiting was occasioned; but the hæmorrhage had very much abated a short time before the tumour came away. A day or two afterwards hæmorrhage returned, a vaginal examination was made, the os uteri was found somewhat dilated, and another tumour was felt pressing upon the opening. I then requested Dr. Lee to see the patient with me, when the same medicine was given as before, and the second tumour was expelled in a few hours by the contractions of the uterus. The only other case of fibrous polypus of the womb which I have had an opportunity of treating, was one of a single tumour of large size, much hæmorrhage had taken place, and I prescribed the infusion of secale cornutum, with as much of the bi-borate of soda as it would dissolve, to be given every hour or two, until eight ounces were taken. Soon after the whole was given the tumour was expelled.

170. The operations advised for removing fibrous polypi are by ligature and by incision. Dr. R. Lee records twenty-seven cases of the removal of fibrous polypi of the uterus, nine terminated fatally (West). Excision of the polypus has been dreaded in these cases, the risk of dangerous hæmorrhage from the operation having been considered great. Velpeau, Lisfranc, Dupuytren, West, and Arnott, however, greatly prefer excision to the ligature. Velpeau found the hæmorrhage troublesome only in two of twenty cases on which he thus operated. "Lisfranc states that he met with but two out of 165 cases; and Dupuytren also but two out of nearly 200; while they all refer to instances of phlebitis, or of peritoneal inflammation leading to a fatal issue after the operation by ligature." Torsion and strangulation of the pedicle by compression have likewise been advised for removing fibrous polypi; but they are liable to the same objections as have been urged against the use of the ligature. It is unnecessary to refer further to the mode of operating by excision, inasmuch as whoever is capable of undertaking the operation requires no directions respecting it, or, if he should, he will find them in Dr. West's work now quoted, or in any systematic work on surgery.

171. I may here mention that fibrous polypi may co-exist with *pregnancy*, and that, although remarkably small previously to impregnation, they may participate in the development of the uterus during this period. They do not, however, generally produce marked symptoms during pregnancy, nor interfere with its natural course. After the commencement of labour their injurious influence becomes manifest, either presenting a mechanical obstacle to the passage of the child, or giving rise to very serious consequences subsequently, by occasioning dangerous hæmorrhage, or other difficulties. They may also at this time lead to very serious mistakes as respects their diagnosis. The question as to their *treatment* at this time is of no small importance; for excision, however great the hæmorrhage, may be followed by phlebitis, or metritis, or pelvic peritonitis. Therefore, if the hæmorrhage cannot be controlled by opiates and astringents, the ergot, or borax may be exhibited, at first singly, and, if they fail, afterwards in combination.

172. IX. Tumours in the Walls and External Surface of the Uterus.—i. *Description*. *a*. These morbid growths are more or less intimately connected with the parietes of the womb, and are in many instances identified with the structure of the organ. Several tumours are more frequently formed in the same case, than one merely; but when thus multiple, "one or two generally outstrip the others in the rapidity of their development, the rate of which, as well as the nature of the symptoms, is greatly influenced by the situation that they occupy." However situated, or however large,

uterine tumours are commonly firm, spherical in form, with nodulated surfaces, and their structure is sometimes interrupted by cavities containing fluid, and varies in density, elasticity, and succulency. They are thus well described by Dr. West: "On a section being made of any of these tumours, they present great similarity to each other, being composed of a dense greyish structure, intersected by numerous dead white bands and lines, which are almost invariably arranged according to a definite type or plan. In some instances these fibres have a concentric arrangement, while in others they have a wavy distribution, or are disposed around several different centres. Tumours of the first kind are usually remarkable for their hardness, and their small degree of vascularity; they are also contained within a remarkably distinct fibro-cellular investment, are imbedded in the uterine substance, and seldom attain a size exceeding that of a shelled walnut. The other varieties are more vascular, less firm, have a less complete capsule, may occupy all parts of the exterior or interior of the womb, and may grow to a very large size, so as to weigh twenty, forty, or even seventy pounds. Moreover, it happens sometimes that in the course of their development, two or more tumours coalesce, at least apparently, so as to form a large growth, though on a section it will be seen that the different growths remain distinct from each other, separated by fibro-cellular septa, the remains of the more complete investment by which, when smaller, each was surrounded." (West's *Lectures*, &c., p. 267.) When these tumours are seated near to the internal surface of the uterus, or under the internal membrane, the fibres of the womb either passing over the surface of the tumour in some parts, or actually passing into it, they form the fibrous polypi, or internal tumours of the uterus already described (§ 164. *et seq.*). The vascularity of these tumours varies in different cases, and, like the tissues with which they are connected, they are resolved into gelatine by boiling.

173. These growths may be developed in any part of the walls of the uterus. Sometimes they are formed "immediately beneath the peritoneum covering the uterus, or the first half inch or inch of the ovarian ligament or Fallopian tubes," and are limited to the fundus, or upper part of the body of the uterus, more frequently on its posterior than on its anterior surface. They there generally remain of a small size, and hardly exceed that of a pea or bean; seldom projecting further than one half of their bulk. In other cases they either grow outwards or inwards, from the thickness of the uterine parietes, being apparently only attached to them by a thick pedicle, into which some uterine fibres enter. The tumours which grow outwards from the uterine walls, sometimes attain the size of a large orange, or even a greater bulk; they, unlike the tumours which grow into the cavity of the womb, receive no investment of fibres from the substance of the organ, and are often present in considerable number. Dr. West mentions as many as twelve projecting from the external surface, the interior of the organ being free from disease. Wherever may be their origins, these growths tend as they increase in size, with few exceptions, to become pediculated; these exceptions being the firm, slightly vascular tumour with concentric arrangement of fibres, which remains imbedded in the uterine walls, without projecting either externally or internally. In rare cases, also, the more vascular, elastic, and succulent fibrous tumour is developed in the uterine walls, attaining the size of the fœtal head, producing very great enlargement of the organ, and retaining a spherical form. It may be imbedded in the substance of the womb, without projecting more in one direction than in another.

174. The influence exerted by these tumours on the womb depends more upon their situation than upon their bulk. When they are seated externally to the womb, and grow into the peritoneal cavity, they often acquire an enormous size, and the womb is much elongated, and even drawn upwards into the pelvis, but seldom increased in bulk. If, however, a small tumour be developed in the walls, or within the organ, more or less increase of size will be observed. These tumours reach the greatest size when they are single and attached to the external surface of the uterus. Walter has described one which weighed seventy-four pounds.

175. *b.* The *ultimate changes* which uterine tumours undergo, are interesting, and often tend, under the influence of vital resistance, to a more or less salutary issue. 1st, When the tumour is externally attached to the uterus, its pedicle may become ultimately so attenuated as to be detached nearly or altogether from the womb, especially if it had formed previously adhesions to the adjoining peritoneum; such cases are, however, very rare. 2d, When the tumour is developed internally, or passes into the cavity of the organ, it undergoes the changes and their results already described (§ 166. *et seq.*). 3d, The tumour is sometimes softened, the more liquid parts are absorbed, and either a calcareous substance is deposited, or remains after the other elements are removed; that the former or actual deposit of calcareous matter takes place is evinced by the quantity of the calcareous matter or deposit. This change takes place both in small and in large tumours, and most frequently in those attached to the outer surface of the uterus; but it may also, but rarely, occcur, in those which are developed internally. Fibrous tumours of the womb were formerly believed to sometimes degenerate into cancer. This change is now considered never to occur. That a tumour, developed in the walls, or attached to either surface, of the uterus, may coexist with cancer of the cervix, is possible, and the coincidence has been observed in rare cases.

176. *c.* The *frequency* of tumours of the uterus has been very differently stated by writers; but they seem to be, with the probable exception of cancer, the most common of organic diseases of this organ. Mr. Pollock states that of 583 cases, in which the uterus was examined at St. George's Hospital, 265 were diseased, and in 39 of them fibrous tumours existed, and in 38 cancer was found. The statistics of the malady are very unsatisfactory. In 70 cases, in which Dr. West examined the uterus of women who died after puberty of other than uterine diseases, 7 presented fibrous tumours of the organ. From these and other observations made by Malgaigne, Braun, Chiari, and others, tumours of the uterus are observed chiefly between the ages of twenty-four and sixty; and most frequently from thirty to fifty.

177. ii. *The symptoms.* — Tumours of the uterus are very often not manifested until they reach a large size; and they exist even many years without producing any inconvenience, or being suspected until they are detected after death. The growths from the exterior surface of the womb frequently occasion no symptoms but those produced by them when they reach a great bulk; or when they disorder the sensibility or functions of adjoining parts. But those which are imbedded in the walls of the organ, disturb either the functions or the sympathetic relations of the womb, although their size may be small. It has been already shown that the growths or polypi which occupy the cavity of the uterus, occasion abundant hæmorrhage and other phenomena. (§§ 162. 168.) When these tumours are formed after the cessation of the catamenia, the severity of the symptoms they occasion is much less than at an earlier epoch; and when they are developed in single women, the symptoms generally become much more severe after marriage, and they often either occasion sterility, or, if impregnation takes place, abortion. If pregnancy take place in these cases, the puerperal states, as well as abortions, are attended by much greater danger than in the healthy state of the uterus. The symptoms of uterine tumours are most commonly slight at their commencement, and slowly increase in severity. They sometimes, however, are sudden, more especially the uterine hæmorrhages, which recur after intervals, and are more and more severe; but, unless when caused by internal growths, are not followed by leucorrhœa or any offensive discharge. Dysuria, or retention of urine, sometimes suddenly occurs. As the tumour enlarges, pain in the region of the uterus, bearing down, and sense of discomfort in the pelvis, are felt, with frequent calls to pass urine. The character of the pain is somewhat peculiar; it is rather a dull, aching, or gnawing, but constant pain, seldom preventing sexual intercourse; yet sometimes attended by throbbings, or a sense of heat or burning, or with intense neuralgic pains such as have been already described. (§ 7. *et seq.*) When these symptoms are present, the abdomen, especially towards the pelvis, should be carefully examined; and if any tumour be detected, the diagnosis between an uterine and ovarian tumour should be made.

178. iii. This *diagnosis* is extremely difficult, and cannot be attempted without a careful examination first of the abdomen, and next per vaginam and in both situations. Tumour of the uterus, when so large as to be felt on examining the abdomen, is always firm, frequently nodulated or uneven, seldom mesial, and generally inclining to either side. On examining per vaginam, the tumour, if uterine, rarely draws the uterus upwards, unless it be attached near the fundus. It is most frequently seated in the posterior parietes, and is, more especially in these cases, accessible to examination. It is then found to be firm, sometimes uneven, carrying the cervix towards the symphysis pubis, and often more or less retroverting the organ, and often displacing it somewhat from the mesial line. The os uteri is generally small, circular, and healthy; or somewhat hard, or enlarged, or turgid. If the tumour be intra-uterine, or be imbedded in the walls, the uterus will be found larger, heavier, and less moveable than natural, and if it be seated low in the womb, the cervix uteri will not be unlike the form assumed in pregnancy, not unfrequently disappearing, and its lips being thinned. Dr. West remarks, that an enlarged, heavy, and somewhat hard uterus, coupled with causeless recurrence and frequent return of uterine hæmorrhage, while the os and cervix uteri are healthy, and I might add absence of pain, or but slight pain during coition, are almost always pathognomonic of fibrous deposit in the uterine substance.

179. Tumour of the uterus must be large to be mistaken for tumour of the ovarium. The former is always slowly developed, and rarely rises out of the pelvic cavity; the latter much more rapidly increases in bulk, and when large rises out of the pelvis. The one is hard, and non-fluctuating; the other is softer, and obscurely, if not more manifestly, fluctuating. The ovarian tumour generally attains a much greater bulk than the uterine, is at first more inclined to either side, and is seldom attended by hæmorrhage during its growth; or by retention of urine when largely developed. The cervix uteri is sometimes drawn upwards, but is seldom altered; whilst large uterine tumours are uneven, nodulated, solid, are attended by alteration of the lower segment of the uterus, and by the absence of, or difficulty of finding, the cervix and os uteri, and not infrequently by retention of urine.

180. The hæmorrhage attending tumours of the uterus, may be mistaken for abortion. The patient not infrequently encourages the opinion of pregnancy from a desire of being in this state, and care should be had not to be thus misled; but to question the patient as to the history of the case; and to examine locally with care and with reference to contingent disease of the uterus and of its appendages. The frequent recurrence of hæmorrhage; the absence or character of pain, and the state of the cervix and os uteri will generally guide the diagnosis in these cases.

181. Fibrous tumour of the posterior uterine wall may be mistaken for retroverted uterus, with which, however, it is often associated. It is, nevertheless, of importance to ascertain the nature of the lesion, although but little may be done as regards its treatment. In these cases, a recourse to the uterine sound, when it can be introduced, may aid the diagnosis; but in most cases, a diagnosis is most difficult, and sometimes impossible. It is also very difficult to distinguish between cancer of the body of the womb and fibrous tumour of the organ, but this will be noticed hereafter (§ 199. *et seq.*).

182. The occurrence of hæmorrhages, the non-developement of the lips of the uterus, and the history of the case, will prevent uterine tumours from being mistaken for pregnancy; for which the expansion of the lower segment of the uterus, and sometimes a sound resembling the uterine souffle, attending the former, may render the diagnosis between it and pregnancy difficult, more especially as the latter may take place, during the existence of an uterine tumour. In these, and many other cases of tumour of the uterus, difficulties of diagnosis, which need not be more particularly noticed will occur, and which the acumen of the physician will readily overcome.

183. iv. *The prognosis* of uterine tumours is not very unfavourable to the duration of life, at least

for several, if not for many years, unless they are very large, or are productive of very serious symptoms, or are associated with pregnancy. In this latter state the abortion they generally occasion, or parturition at a natural period, is often attended by more or less danger. When the tumour is intra-uterine, constituting the fibrous polypus above described (§ 164. *et seq.*), a cure is then generally accomplished. But the other states of the malady do not admit of cure, and not always of palliation, although this latter should always be attempted, inasmuch as it is often to be attained, and nature, in rare cases, seems to effect a cure in such circumstances, especially when the disease occurs at an advanced period of life,— the cessation of the menses tending to favour this result. The prognosis may also be somewhat more favourable when these lesions occur in an unmarried female, or in a widow, than when they affect a married female during the epoch of sexual activity.

184. v. *Treatment.* Although the treatment of tumours of the uterus is chiefly palliative, yet more active means should not be neglected, with the view of promoting the gradual absorption of the morbid deposit. The patient should avoid sexual excitement; if married she ought to sleep apart from her husband; and be as physically and mentally tranquil as circumstances may permit her to be. Walking much, or standing long, more especially riding on horseback, or even in a carriage, should be altogether avoided; and the recumbent posture adopted as long as possible, and without any intermissions during the existence of uterine hæmorrhage. The bowels ought to be kept gently open by cooling laxatives, and more particularly by such as neither irritate the larger bowels, nor sympathetically excite the uterus. With this intention the carbonates, the tartrates, or the acetates, or the phosphates of the fixed alkalies may be prescribed, either alone or with the infusion of senna or rhubarb, or with the extract of taraxacum. Hæmorrhages are amongst the more urgent symptoms for which palliation is requisite. These generally at first occur as an excessive menstruation, and recur with each period; and ultimately they often appear intercurrently, or between each period. The means which I have advised above (§ 169.) for arresting the hæmorrhage and expelling the tumour when seated within the womb, might prove of doubtful benefit or even injurious, if prescribed, when the tumour is not thus situated, or when seated as described in this chapter. Therefore the recumbent posture, undeviatingly observed, and astringents and refrigerants taken from the commencement of the hæmorrhage, are indispensable.

185. Where there is either pain or tenderness in the lower part of the abdomen on the accession of this discharge, a few leeches may be applied on this part; or a small cupping over the sacrum be ordered; or dry-cupping on this situation may be substituted for it, when the abstraction of blood appears injudicious; but in these cases the modern fashion of applying leeches to the uterus itself should not be followed. The turpentine embrocation may be afterwards applied over the hypogastrium. Sedatives and refrigerants should be given with astringents; and if the pain be urgent, narcotics and the other means advised for neuralgia of the uterus (§§ 14—17.) may be added. The nitrate of potass may be thus prescribed with the liquor ammoniæ acetatis, with the acid in excess, and with the spirit of nitric æther and tincture of henbane; or the hydrochlorate of ammonia with hydrochloric acid, and hydrochloric æther, may be taken in the infusion of cinchona, or simple infusion of roses, in different circumstances of the disease. If the hæmorrhage be excessive, the more energetic anti-hæmorrhagic remedies, as the infusion or tincture of matico, gallic acid, tannin, the spirits of turpentine, the extract of log-wood, &c., may be had recourse to. When the patient is anæmic, or when there is a more continued draining of blood, the muriated tincture of iron, with an additional quantity of the acid, will be given with benefit, with the compound tincture of camphor, or with the infusions of calumba or quassia.

186. I have had reason to believe that a judicious recourse to the iodides has not infrequently been productive of some benefit. The iodide of potassium should generally be preferred, and be conjoined with the solution of potass, or with Brandish's alkaline solution, or with either of the carbonates; but it ought always to be prescribed in small doses, and be long persisted in. In other, or in anæmic, cases, the iodide of iron may be given in syrup of sarza. The bromides of magnesium and of potassium have been considered as being equal, if not superior, to the iodides, but chiefly from the circumstance of their presence in certain mineral springs, as those of Kreuznach, which have been much employed, both internally and as baths and hip-baths daily, in cases of uterine enlargements and tumours, and with apparent benefit in many cases. These waters may be had in this country. M. Velpeau suggested an operation consisting of the enucleation of fibrous tumours of the uterine parietes by an incision through the os uteri or the lower segment of the womb. M. Amussat performed this operation in 1840, and it has been subsequently resorted to by others—by Bérard, Boyer, Simpson, and others; and with success by my friend Dr. Pancoast of Philadelphia, by Mr. Teale of Leeds, M. Amussat, in two cases, and by M. Maisonneuve; but as the number of unsuccessful cases is much greater than that of the successful; and as their details are by no means encouraging, the hæmorrhage and other consequences being alarming, this operation should not be recommended.

187. X. Tubercular Degeneration *of the internal surface of the uterus* is sometimes met with, in the form of a dirty yellow matter, closely resembling the substance of a tubercular bronchial gland at an early stage of softening. This matter is about an eighth of an inch in thickness, extends over the whole internal surface, but rarely into the cavity of the cervix, and more frequently into the Fallopian tubes, which it more or less distends, and is sometimes associated with tubercular degeneration of the ovaries. I observed this association in a young lady who died of consumption at nineteen years of age, and who had never menstruated. Rokitansky thinks that it never occurs primarily in the cervical canal. Upon scraping off this deposit from the internal uterine surface, it is found that the whole of the internal membrane is removed and replaced by it, and that it is closely applied to the proper structure of the organ, which, with its cavity, is more or less

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for several, if not for many years, unless they are very large, or are productive of very serious symptoms, or are associated with pregnancy. In this latter state the abortion they generally occasion, or parturition at a natural period, is often attended by more or less danger. When the tumour is intra-uterine, constituting the fibrous polypus above described (§ 164. *et seq.*), a cure is then generally accomplished. But the other states of the malady do not admit of cure, and not always of palliation, although this latter should always be attempted, inasmuch as it is often to be attained, and nature, in rare cases, seems to effect a cure in such circumstances, especially when the disease occurs at an advanced period of life,— the cessation of the menses tending to favour this result. The prognosis may also be somewhat more favourable when these lesions occur in an unmarried female, or in a widow, than when they affect a married female during the epoch of sexual activity.

184. v. *Treatment.* Although the treatment of tumours of the uterus is chiefly palliative, yet more active means should not be neglected, with the view of promoting the gradual absorption of the morbid deposit. The patient should avoid sexual excitement; if married she ought to sleep apart from her husband; and be as physically and mentally tranquil as circumstances may permit her to be. Walking much, or standing long, more especially riding on horseback, or even in a carriage, should be altogether avoided; and the recumbent posture adopted as long as possible, and without any intermissions during the existence of uterine hæmorrhage. The bowels ought to be kept gently open by cooling laxatives, and more particularly by such as neither irritate the larger bowels, nor sympathetically excite the uterus. With this intention the carbonates, the tartrates, or the acetates, or the phosphates of the fixed alkalies may be prescribed, either alone or with the infusion of senna or rhubarb, or with the extract of taraxacum. Hæmorrhages are amongst the more urgent symptoms for which palliation is requisite. These generally at first occur as an excessive menstruation, and recur with each period; and ultimately they often appear intercurrently, or between each period. The means which I have advised above (§ 169.) for arresting the hæmorrhage and expelling the tumour when seated within the womb, might prove of doubtful benefit or even injurious, if prescribed, when the tumour is not thus situated, or when seated as described in this chapter. Therefore the recumbent posture, undeviatingly observed, and astringents and refrigerants taken from the commencement of the hæmorrhage, are indispensable.

185. Where there is either pain or tenderness in the lower part of the abdomen on the accession of this discharge, a few leeches may be applied on this part; or a small cupping over the sacrum be ordered; or dry-cupping on this situation may be substituted for it, when the abstraction of blood appears injudicious; but in these cases the modern fashion of applying leeches to the uterus itself should not be followed. The turpentine embrocation may be afterwards applied over the hypogastrium. Sedatives and refrigerants should be given with astringents; and if the pain be urgent, narcotics and the other means advised for neuralgia of the uterus (§§ 14—17.) may be added. The nitrate of potass may be thus prescribed with the liquor ammoniæ acetatis, with the acid in excess, and with the spirit of nitric æther and tincture of henbane; or the hydrochlorate of ammonia with hydrochloric acid, and hydrochloric æther, may be taken in the infusion of cinchona, or simple infusion of roses, in different circumstances of the disease. If the hæmorrhage be excessive, the more energetic anti-hæmorrhagic remedies, as the infusion or tincture of matico, gallic acid, tannin, the spirits of turpentine, the extract of log-wood, &c., may be had recourse to. When the patient is anæmic, or when there is a more continued draining of blood, the muriated tincture of iron, with an additional quantity of the acid, will be given with benefit, with the compound tincture of camphor, or with the infusions of calumba or quassia.

186. I have had reason to believe that a judicious recourse to the iodides has not infrequently been productive of some benefit. The iodide of potassium should generally be preferred, and be conjoined with the solution of potass, or with Brandish's alkaline solution, or with either of the carbonates; but it ought always to be prescribed in small doses, and be long persisted in. In other, or in anæmic, cases, the iodide of iron may be given in syrup of sarza. The bromides of magnesium and of potassium have been considered as being equal, if not superior, to the iodides, but chiefly from the circumstance of their presence in certain mineral springs, as those of Kreuznach, which have been much employed, both internally and as baths and hip-baths daily, in cases of uterine enlargements and tumours, and with apparent benefit in many cases. These waters may be had in this country. M. **Velpeau** suggested an operation consisting of the enucleation of fibrous tumours of the uterine parietes by an incision through the os uteri or the lower segment of the womb. M. **Amussat** performed this operation in 1840, and it has been subsequently resorted to by others—by **Bérard**, **Boyer**, **Simpson**, and others; and with success by my friend Dr. **Pancoast** of Philadelphia, by Mr. **Teale** of Leeds, M. **Amussat**, in two cases, and by M. **Maisonneuve**; but as the number of unsuccessful cases is much greater than that of the successful; and as their details are by no means encouraging, the hæmorrhage and other consequences being alarming, this operation should not be recommended.

187. X. **Tubercular Degeneration** *of the internal surface of the uterus* is sometimes met with, in the form of a dirty yellow matter, closely resembling the substance of a tubercular bronchial gland at an early stage of softening. This matter is about an eighth of an inch in thickness, extends over the whole internal surface, but rarely into the cavity of the cervix, and more frequently into the Fallopian tubes, which it more or less distends, and is sometimes associated with tubercular degeneration of the ovaries. I observed this association in a young lady who died of consumption at nineteen years of age, and who had never menstruated. **Rokitansky** thinks that it never occurs primarily in the cervical canal. Upon scraping off this deposit from the internal uterine surface, it is found that the whole of the internal membrane is removed and replaced by it, and that it is closely applied to the proper structure of the organ, which, with its cavity, is more or less

CLARKE, who first described this malady, have viewed it as less formidable, and have stated that that it is sometimes curable. It is not improbable that the medullary form of cancer of the cervix may present fungoid or confervoid growths, of a cauliflower appearance; and that an intractable but non-cancerous ulcer of the os uteri may give rise to large fungoid granulations bleeding on the slightest touch, and both lesions may be thus confounded, the former, however, not admitting of cure, the latter in rare cases. Both these lesions are attended by frequent, exhausting, and dangerous hæmorrhages. These morbid growths consist, microscopically, of "hypertrophied papillæ, composed of epithelial cells, richly supplied in their interior with large and delicate vessels, and covered by a thickened layer of epithelium. The enormous looped capillaries of the cauliflower excrescence explain the abundant hæmorrhages, and the profuse serous discharges which attend it; while the absence of that solid structure which is found in other forms of epithelial cancer accounts for the favourable results that have followed its extirpation."

198. *D. Corroding ulcer* of the os and cervix uteri, first described by Dr. J. CLARKE, begins in the mucous membrane, and involves the whole circumference of the os, utterly destroying both it and the subjacent parts. It differs from cancer in the absence of thickening, hardness, or deposit of heterologous matter, and in its prolonged existence — sometimes for several years without being attended by any dangerous symptoms. It appears to be analogous to lupus, and is more strictly a rodent form of ulcer, than a variety of cancer.

199. ii. SYMPTOMS OF CANCER UTERI. — The symptoms which are most constantly observed in cancer uteri — namely, pain, hæmorrhage, and vaginal discharge — may attend other lesions of the organ; but in all cases where they, or even any two of them, are present, a careful vaginal examination ought to be made. — *a. Pain*, accompanied with hæmorrhage or leucorrhæa, is a very frequent, but not a constant, symptom. It varies much in character and intensity, both at the commencement and in the course of the malady; and very often, when the hæmorrhage is profuse, but little pain, or merely a back-ache, is felt. At an early stage the pain is generally not severe, nor is it always referred to the uterus, but more commonly to the loins. The organ is seldom tender to the touch, and sexual intercourse is not often productive of suffering. The pain, as the disease advances, is referred to one or other of the iliac regions, and either comes on, or is exacerbated in paroxysms, and a lancinating pain referred to the uterus occurs suddenly and at intervals. Menorrhagia may be either attended, or not attended, by pain. In many cases it is, when very profuse, followed by severe pain. With the progress of the malady the pain generally becomes more severe; but towards the close, when the cachexia and anæmia are most remarkable, the sufferings of the patient generally abate more or less. But before this ultimate stage appears, pain in the uterus is added to that in the back and hypogastrium, and to the other distressing symptoms experienced. The pain is, in some cases, described as burning, darting, cutting, &c.; and it is generally aggravated into intolerable paroxysms, especially towards or during the night, stabbing or lancinating pains recurring after short but irregular intervals. When an attack of hæmorrhage supervenes on severe pain, some degree of relief is sometimes afforded for a short period. As the disorganisation extends to the bladder, the vagina, or rectum, or even to them all more or less, the sufferings of the patient are accordingly increased; and when utero-vesical fistula is formed, the distress is further aggravated, and rendered still more harassing. In a very few cases, however, the disease runs its course entirely, or almost entirely, without pain. But it is not so rare for pain to be absent through a great part of the course of the malady, and appear only at a far advanced period. The absence of pain throughout the disease, or until an advanced stage, occurs chiefly in the epithelial and medullary forms of cancer uteri.

200. *b. Hæmorrhage* is the next symptom in importance; but is not always a sign of the commencement of the ulcerative stage of cancer uteri, for it is, in a very large proportion of the cases, the earliest sign, preceding, and unattended by, either pain or watery offensive leucorrhœa, for a longer or shorter time. The occurrence of hæmorrhage, whether with or without pain, without any sufficient cause, should always induce to a vaginal examination. The bleeding may not be profuse, but continuous and prolonged, or resemble the ordinary menstrual period, excepting only its non-occurrence at the proper period, or its frequent recurrence. It sometimes assumes this character in females past the catamenial epoch of life, and in whom the menses had ceased for a longer or shorter time. When it thus appears, the existence of the malady should be suspected. When cancer uteri commences at an early period of life, the hæmorrhage most frequently occurs at the menstrual periods, or a day or two after their cessation; but menstruation is generally irregular during the course of the disease, being either too early, or passing over a period, the next being excessive. With the progress of the malady, pain is generally added to hæmorrhage. The source of this discharge appears to be chiefly the internal surface of the cervix and body of the womb; for the hæmorrhage may be excessive before ulceration has taken place, and even when this has undoubtedly supervened, the bleeding may still proceed from the surface of these parts, rather than the ulcerated part; for, in many cases, this discharge has been the least where the ulceration has been the greatest, and proceeded the furthest. The paroxysmal expulsive pains often attending the hæmorrhage are usually due to the efforts of the womb to expel coagula formed within it.

201. *c.* The *leucorrhœal discharges* differ in the forms and stages of cancer uteri. A mucous or muco-puriform discharge is frequent at an early period, and is then generally not offensive. But as the malady advances, it is commonly more or less offensive, and it becomes more watery, or appears as a dirty and very offensive sanies. An offensive discharge may accompany any of the chief organic lesions of the uterus; but, although it may exist in these, it seldom occurs in so marked a manner as in cancer. The continuance, the quantity, offensiveness, and other conditions of the discharge, depend upon a variety of circumstances — upon the

stage and form of the malady, upon the extent to which ulceration has advanced, upon the retention or non-retention of the morbid fluid, upon the frequency of its removal by injections, hæmorrhages, &c. In a few instances, an offensive discharge has preceded either the pain, or the hæmorrhage, or both, although much more rarely; and, still more rarely, this has existed for so long a period, and has given rise to so little suffering or cause of complaint otherwise, that when at last recourse to medical aid has been had, the cervix uteri has been destroyed, and the finger has passed into the cavity of the organ.

202. These symptoms, the most severe which attend cancer uteri — the pain, the hæmorrhage, and the offensive leucorrhœa — cannot undoubtedly prove the existence of the malady. They may individually, or even conjointly, attend other organic lesions of the uterus. But viewing them severally and in connection with the evidence furnished by a vaginal examination, and with the constitutional symptoms characterising the course and the advanced stage of the malady (see art. Cancer, §§ 20, *et seq.*), especially the cancerous cachexia, the existence of cancer uteri cannot be mistaken. The remarkable disorder of the digestive organs, the impaired assimilation, and the waste of the red globules of the blood, and even also of the tissues, and the consequent cachectic or cancerous anæmia; the frequent recurrence of disorder of the bowels, more especially of diarrhœa, with both abdominal and hypogastric pains; the distress often caused by defæcation, and more particularly by the state of the urinary organs, and by the urinary discharges, are all indicative of the nature of the malady.

203. Cancer uteri does not prevent a female from becoming *pregnant* at an early stage of the malady; but the process of parturition, and the changes in the uterine organs and in the female economy that follow, generally accelerate, often with great rapidity, its course. Parturition, owing to the effect of this act upon the diseased parts, especially the cervix, often is accompanied by dangerous hæmorrhage, or followed by severe or fatal inflammation. In some of these cases, both mother and child have died before delivery has been accomplished; generally the process is difficult and prolonged. In some cases, gestation is also prolonged beyond the natural period, and, in rare instances, death has occurred without the efforts of the uterus having been sufficient to expel the fœtus.

204. Dr. West has given, in his interesting lectures, a table of the result of seventy-four cases of cancer of the cervix uteri *complicating labour*; and of these 41 died soon after labour, and 33 recovered for a time from the effects of this process. Of 72 children, it is stated that 47 were dead-born, and 25 born alive. He found that the average duration of 17 cases of cancer uteri, which he carefully observed, was 15 months; and that of 39 cases, as given by Lebert, was 16 months. It is thus apparent that cancer uteri is more rapid in its progress than cancer in other organs. The average duration of all forms of cancer is stated by this writer to be 18 months, and of cancer of the mamma and of the testis, the most prolonged, not to exceed three years and a half.

205. iii. The Prognosis of cancer uteri may be inferred from what I have stated above, and in the article Cancer (§§ 20—22.) Rokitansky remarks that "cases of spontaneous recovery from uterine cancer are of extreme rarity, but they do occur; the carcinoma and the cancerous ulceration are then limited to the cervix, the internal orifice forming the boundary. The loss of substance heals with a funnel-shaped cicatrix." (*Op. cit.* p. 303.) In a case, the progress of which was constantly observed by me, recovery took place whilst a diet and regimen, hereafter to be noticed, was strictly observed. The cicatrix, which was formed low in the vagina, was shaped as Rokitansky has described it; not more than half an inch of the vagina above the urethra having been left uncontracted.*

206. iv. Causes of Cancer Uteri. These are the same as have been stated respecting cancer in general. But there are certain particulars which require notice with reference to this malady, when originating, as it commonly does, in the neck of the womb. The mortality of cancer in females is nearly three times greater in London than in males, and more than double the number of the deaths from cancer in males throughout England; the excess in females being evidently due to the frequency of cancer of the womb and of the breast among them. According to Tanchou, the deaths from cancer of the womb, stated in the Mortuary Registers of Paris, as compared with those from cancer of the breast, were as 2¼ of the former to 1 of the latter.

207. Age manifestly predisposes to cancer: but this disease appears to occur at an earlier period in the uterus, than in the mamma; for in the latter it is rare at the age of thirty, whereas it is not so rare at this age in the former situation. Cancer uteri increases in frequency with the advance in life, as Dr. Walshe has shown; but in order to render the increase more manifest, the number of cases at a given age should be calculated with reference to the number of females supposed to exist at the same progressive periods of life. The inference deducible from this fact is, that the occurrence of cancer is in some degree favoured by the depression or exhaustion of vital

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* Mrs. C—, at the age of 36, first complained of symptoms indicating an early stage of cancer uteri. The disease advanced, and several medical men were consulted at her own or my suggestion. The cervix had become much affected, and the disease extended far down the vagina with distressing irritability of the bladder. At this time she found Dr. Lambe's work on "*a peculiar Regimen, &c., in the Treatment of Cancer, &c.,*" in my library. He was consulted in her case; and he recommended her to remove to a dry and healthy locality in the vicinity of London; to strictly observe a vegetable diet, to drink only distilled water, and use only distilled water in cooking, and for infusing tea or other substances. These injunctions were observed without any deviation, and under his supervision. In the course of a few weeks amendment was very apparent, and in somewhat less than twelve months a cicatrix, as situated and described above, was formed. The patient continued this regimen for nine or ten years; and enjoyed excellent health. After this period she began to partake of fish, the flesh of chickens or rabbits, &c. She afterwards ventured further upon animal food, and occasionally took a glass of old wine. Five or six years more elapsed, when she complained of the right mamma, and when examined the disease was commencing in it; but no complaint was made of the parts in the vicinity of the first disease. The diet was now altered, but the malady proceeded slowly; and having been unusually prolonged, extended inwards, affected the pleura; and ultimately the vaginal cicatrix was attacked, and she ultimately sunk,—more than twenty years from the commencement of the malady in the cervix, and after an interval of nearly fifteen years of good health.

power taking place from the progress of age; as well as from other causes of vital depression. Dr. West has given a table of the ages of 426 cases of cancer uteri, collected from various sources: —

	Actual number.		In the proportion of 1 to 10,000 of the whole population existing at the respective ages.
Between 25 and 30 years	25	or	1 in 134
„ 30 „ 40 „	112	„	1 „ 21
„ 40 „ 50 „	178	„	1 „ 9·7
„ 50 „ 60 „	71	„	1 „ 16·6
„ 60 „ 70 „	35	„	1 „ 23·6
Above 70 „	5	„	1 „ 108·

From this data it would appear that, although cancer uteri becomes more frequent as life advances up to fifty or sixty, it diminishes considerably in frequency from these ages; and from this table, as well as from other sources of information, it cannot be inferred, that the actual cessation of the catamenia has any influence in favouring the occurrence of this malady in the uterus. Dr. West justly remarks that the state of the uterine functions previously to the appearance of cancer is not without interest; and he adds that, in 108 cases, this matter was made the subject of special inquiry. In 94 cases these functions were in all respects natural from their complete establishment to the commencement of the disease; and in 14 they were either habitually or frequently unnatural, being painful, postponing, or irregular. Out of 116 married women affected with cancer uteri, only 7 were sterile. The hereditary predisposition to cancer has been well established, as shown in the article on Cancer (§ 23.). Mr. Paget found that this malady in all situations was hereditary in the proportion of one to 6·1; Mr. Lebert, in the ratio of one to 7·2; and Dr. West in 1 to 6·2. The proportion of hereditary cases is very probably higher than here stated, as it is difficult to ascertain from the patients the nature of the disease which caused the death of either, or of both parents.*

208. v. Treatment of Cancer Uteri is necessarily confined to palliating the suffering of the patient, and to attempts at delaying the approach of death. The symptoms which more especially require mitigation are *hæmorrhage*, *pain*, and the *offensive discharge*. The means which should be resorted to for the first and second of these have been fully described in the articles Hæmorrhage, Neuralgia, and Cancer; but there are a few topics connected with the treatment of cancer affecting the uterus, and of the effects of this malady, which require further consideration.

209. *a. Hæmorrhage* is amongst the earliest and most alarming symptoms of cancer uteri. The obvious intention is to abate it when severe or too frequent, and to prevent its recurrence altogether, or before the catamenial period. The various means usually employed for *Hæmorrhage from the uterus* have been detailed (see art. Hæmorrhage, §§ 263—273.); but there are a few of these which require a more particular notice at this place. The *gallic acid* in doses of six to eight grains of every four or five hours, have been often found of decided service in arresting the hæmorrhage. The infusion of *matico*, used as an injection into the vagina, is also very efficacious. Dr. West states that, in some cases of medullary and of epithelial cancer, when the hæmorrhage is excessive, or prolonged, the morbid tissue may be broken down with the finger, and the tincture of the *sesquichloride of iron* injected into the midst of it. The extravasated blood is thereby coagulated, and the vessels destroyed, the whole mass thus treated sloughing away. Kiwisch, who first resorted to this practice, remarks that it is not attended by much pain or serious constitutional disturbance. He also advises a recourse to the actual cautery, where the surface is too firm to be broken down. In one case, after other means had failed, I recommended the injection of the spirits of turpentine, in the manner in which the tincture of the muriate of iron has just been advised, the same medicine being given frequently by the mouth in small doses; and the hæmorrhage was for the time arrested. It is obvious that sexual intercourse is liable to occasion an attack of hæmorrhage, and that it should, therefore, be strictly forbidden whenever cancer uteri is suspected.

210. *b. Pain* is often so excessive as to require energetic means of relief; but, as long as it is not acute, the gentler remedies only should be employed. The pain is sometimes brought on, or aggravated by an irritable state of the bladder, or by the condition of the urine, and not infrequently by neglect of the functions of the bowels. Therefore, the states of both the urinary and fæcal evacuations should receive due attention. The former may be corrected, and the irritable condition of the bladder mitigated, by the exhibition of the solution or the bi-carbonate of potash with tincture of henbane, or by the mineral waters of Ems or of Vichy. If the urine abound in the phosphates, the means I have advised for this condition, when treating of the morbid states of the Urine (§§ 90. *et seq.*), especially the hydrochloric acid taken in the decoction of pareira, or in the infusion of buchu, may be prescribed. The bowels may be regulated by means of the gentle cooling aperients ordered above (§ 184.).

211. When the pain becomes so severe as to require anodynes, then plasters of opium or belladonna may be applied over the sacrum or above the pubes; and chloroform may be tried as an epithem, by means of spongeo-piline. Internally the pilula saponis cum opio, or tincture of opium, may be given at night; and if these occasion neither headach nor sickness in the morning, they may be continued without increasing the dose. The preparations of morphia, unless conjoined with aromatic stimulants, often cause unpleasant depression. The black drop, and Battley's sedative solution, are often preferred to other opiates, but they are efficacious chiefly in their more powerful narcotic effects, the subsequent distressing sickness, &c. being not less complained of. Henbane and conium are often employed. The former, without alleviating pain, or with slight alleviation only, often affects the head, occasioning restlessness and headach. I have, however, found the two conjoined with camphor — three grains each of camphor, and of the extracts of

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* I have noticed the question "Is Cancer contagious?" when treating of Scirrhous and other Tumours (§§ 79, 80.); and have referred to cases, one of which was under the care of the late Mr. Mayo and myself, in which cancer of the glans penis in the husband communicated the disease to the cervix of the uterus. I have there stated my reasons for inferring that the disease may thus be communicated to the wife by the husband.

henbane and conium, being more or less of service. Dr. West says that after henbane he generally makes trial of the Indian hemp; for, although it is an uncertain remedy, it does not disorder the stomach, or occasion headach. But I have not always found it so pleasant in its ultimate effects. In severe paroxysms of pain, the inspiration of the vapour of chloroform has been resorted to; but the relief has been only very temporary. I have, in a few cases, directed the application of the tincture of belladonna to the diseased part, in the manner advised and resorted to by the late Dr. Moore (§ 15.) with very marked relief. Taken internally, belladonna seldom affords much relief, unless in large doses, which are usually followed by much depression, unless they are conjoined with aromatic stimulants; and these latter often fail in correcting the evil.

212. *c.* The *discharges*, owing to their great excess, or their very offensive odour, require, besides the usual attention to cleanliness, the means which have been advised for the more severe cases of Leucorrhœa, more especially the infusion of matico, or tannin; the decoctions of oak-bark, of buchu, of cedar-bark, or of pomegranate bark, &c. Weak acid lotions, and various other astringents, have also been recommended. Dr. West mentions the use of an injection of ʒj of sulphate of iron, and ʒiij of the extract of conium to a pint of water; and he adds that a solution of ℈j to ʒss of nitrate of silver to an ℥j of water injected immediately into the diseased structure, has the effect of hastening the separation of the slough and of destroying the bad odour. I have most frequently employed, for these purposes, the chloride of lime, or creasote, or both, in injections, consisting chiefly of mucilaginous fluids, in quantity and frequency according to the progress and urgency of the case. When the disease was very far advanced, and the use of these appeared likely to occasion inflammation of the peritoneum or adjoining parts, I have preferred to have recourse to powdered carbon, with tincture of belladonna, or extract of henbane, mixed in any mucilaginous fluid, as a vaginal injection. It has generally the effect of deodorising the discharge, and soothing the pain.

213. *d.* The *complication* of pregnancy with cancer uteri must be treated according to the peculiarities of each case; but its treatment cannot be entered upon at this place. It is fully considered in Dr. West's work already referred to, where the reader will also find the results of extirpation of the uterus and of its cervix very satisfactorily discussed. To this work, and to surgical writings on this subject, I must refer the reader.

214. *e.* The *constitutional treatment* of cancer uteri, or the means most appropriate to the existing cancerous cachexia, is not different from what I have advised in the articles on Cancer (see §§ 27—44.) and on Scirrhous Growths (§§ 113. *et seq.*) The chief objects proposed are to promote the digestive and assimilating processes, and to support constitutional power, and vital resistance to the progress of the malady. Subordinately to, and forming a part of, these may be mentioned, due attention to the secreting and excreting functions, and the alleviation of the more distressing symptoms. The anæmia attending the advanced stages of the malady should also claim our attention; and chalybeate preparations, and chalybeate mineral waters, ought to be conjoined with such other means as the circumstances of each case will suggest.

215. *f.* In respect of *diet* and *regimen* little need be added to what has been already stated in the places just now referred to. A digestible and nourishing food, in moderate quantity, and a temperate and dry air, are generally beneficial. It has been questioned whether much, or even any, animal food be of service, or rather whether it be not detrimental, in this malady. This matter has been fully and ably discussed by my late friend, Dr. Lambe, a very learned physician, and an original thinker and observer. He imputed this malady, as well as scrofula, gout, consumption, and some other chronic diseases, to the use of animal food and to impure water; and advised vegetable food of all kinds, in sufficient abundance, and distilled water, for all purposes of internal use, and exercise in a dry and open air, to be resorted to for the cure of this, as well as of those diseases. He did not believe that, when cancer was far advanced, this diet could then effect a cure, but he recommended it to be tried; and, at the same time all fermented and distilled liquors, or other beverages than distilled water, to be relinquished. This diet and regimen were employed with apparent success, as long as it was strictly adhered to by a married female, whose case I have briefly noticed in a note at p. 1281. § 205.

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VACCINATION. — SYNON.:— *Vaccinia* (from Vacca, a cow), *Variola vaccinia*; *Variolæ vaccinæ*; *Vaccine*, *vaccination*, Fr.; *Kuhpocken*, *Schutzblattern*, Germ.; *Vaccina*, *Vaccinazione*, Ital.; *Vaccine*, *Cow-pox*.

CLASSIF.—III. CLASS. III. ORDER. (*Author in Preface, &c.*)

1. DEFIN.—*Variola vaccinia—a vesicular disease developed in the human subject by inoculation of cow-pox, or of the lymph from the variolous vesicles, affecting the cow.*

2. I. HISTORY OF. — It would appear, from ancient Sanscrit writings, that vaccine inoculation had been practised in India from the earliest ages, and that the preservative influence of vaccination was known, and had recourse to, in different parts of the East. Mr. BRUCE, Consul at Bushire, states, that vaccination was well known in Persia for many ages. HUMBOLDT found among the inhabitants of the Cordilleras of the Andes the belief that the eruption on the udder of the cow preserved them from small-pox. These indications of the practice of vaccinations were, however, unknown at the time when EDWARD JENNER, a general practitioner in Berkeley, observed the protective influence of the vaccine disease from the natural and inoculated small-pox, and when he submitted this influence to the tests of experiment and practical observation. In 1775 Dr. JENNER remarked, that a number of persons in Gloucestershire could not be inoculated with small-pox; and, having become aware that there was a popular belief that persons who had caught the cow-pox, from milking the cows, were not subject to small-pox, he was induced to investigate the grounds for this belief. In the course of his researches, and after encountering numerous difficulties and opposing opinions, which would have discouraged all but those who possessed a determined will and powerful genius, he found that the cow was subject to a variety of eruptions on the teats, all of which had received indiscriminately the name of cow-pox. He learned to distinguish between these, and ascertained that one only was possessed of a specific protective power over the human body. This he called the *true* cow-pox, the others the *spurious*. He next ascertained that the true cow-pox underwent progressive changes; and that it was only at one period of its progress, or in the acme of eruption, when it was endowed with specific or preventive, or anti-variolous properties. During the investigation of this branch of the subject, Dr. JENNER was struck with the brilliant idea that it might be practicable to propagate the disease by inoculation, first from the cow, and successively from one human being to another. It was not, however, until 1796 that he was enabled to take the decisive step of inoculating for the cow-pox, upon the success of which his grand scheme mainly rested. An opportunity of testing his ideas by satisfactory experiments was not afforded him until that year, when cow-pock matter in an active state was found, and parents were met with possessing sufficient confidence to submit their children to the important trial. On the 14th of May, 1796, James Phipps was vaccinated with matter taken from the hands of Sarah Nelmes. He passed through the disorder in a satisfactory manner, and was tested by variolous inoculation, on the 1st of July following. The small-pox inoculation took no effect. JENNER now prepared to communicate the result of his long investigations concerning cow-pox, but delayed his work in the hope of furnishing additional proofs of the success of vaccination. These he was enabled to procure; and in June, 1798, he published, in London, his original essay, entitled, "An Enquiry into the Causes and Effects of the Variolæ Vaccinæ; a Disease discovered in some of the Western Counties of England, particularly Gloucestershire, and known by the name of the Cow-pox." This work deserves a particular notice. In it Dr. JENNER states his belief that this disorder does not originate in the cow, but is communicated to this animal from the horse, where it appears on the heels, and is known by the name of the *grease*; the hands of farm-servants and milkers being the medium of communication. He next suggests that the small-pox itself may have been originally morbid matter of the same kind, which circumstances had changed and aggravated into a contagious and malignant form. He afterwards states his conviction that cow-pox inoculation leaves the constitution for ever after secure from the infection of small-pox; and he concludes by enumerating four classes of persons to whom cow-pox inoculation holds out the prospect of great benefit:— 1st, Those who, from family predisposition, may be presumed likely to take small-pox unfavourably; 2nd, persons of a scrofulous diathesis; 3rd, those who, from idiosyncrasy, resist small-pox inoculation in early life; and, 4th, those who are labouring under chronic forms of disease, in which counter-irritation is desirable.

3. At the end of July, Mr. CLINE made the first experiment with cow-pox in London, which succeeded perfectly; and soon afterwards recourse was had to vaccination in many places. In his second publication, dated April, 1799, Dr. JENNER judiciously recommended calmness and moderation in researches into the efficacy of cow-pox inoculation; but in 1800 he expressed his conviction that the cow-pox is capable of extirpating small-pox from the earth; and in his fourth publication, May, 1801, he again expressed

the same sanguine opinion. The commencement of this century was remarkable for the progress of vaccination. In 1801, upwards of six thousand persons had been vaccinated, and the greater part had been tested with small-pox. In 1800, 1801, and 1802, vaccination was introduced into France, Germany, Italy, Spain, and the East Indies. In 1802, parliament voted Dr. Jenner a reward of 10,000*l.* for the discovery, and, in 1807, the additional sum of 20,000*l.*; and in 1808 vaccination was taken under the protection of Government.

4. In 1809, Mr. Brown, of Musselburgh, published the opinion that the prophylactic virtue of cow-pox diminished as the time from vaccination increased. In 1818 and '19, an epidemic small-pox pervaded Scotland, and many vaccinated persons passed through a mild form of variola. The term, "modified small-pox," was now adopted. Dr. Monro, in 1818, published a volume on "*the different kinds of small-pox, and especially on that which sometimes follows vaccination*;" and in 1820, "*An Account of the Varioloid Epidemic*" was published by Dr. Thomson, of Edinburgh. Between this date and 1823, when I wrote on the subject, as well as subsequently to the latter year, some very remarkable cases came before me in both public and private practice, occurring in the same and in different families, proving the impairment of the protective influence of vaccination with the growth of the body, and the lapse of time, until it entirely ceased, at least in many cases, after puberty, when vaccination was performed in infancy.

5. In 1825 the Bills of Mortality announced 1300 deaths by small-pox, among whom were several persons who had been vaccinated. Small-pox was epidemic in France in 1826 and '27, and in the northern parts of Italy in 1829; and in consequence of the numbers of the vaccinated who had been attacked by small-pox more or less modified or unmodified, the practice of revaccination commenced in Prussia and the German States, and was subsequently encouraged by their governments. This practice has more recently been voluntarily adopted by many in this country. In 1833—4, small-pox prevailed epidemically in Ceylon, when a considerable number of the vaccinated died; and it made great devastations in Hindostan on several occasions, both prior and subsequent to this date, and many of the vaccinated have been carried off by it. Dr. Gregory states that the admission into the Small Pox Hospital, in 1838, more than doubled the average number received annually, prior to the discovery of vaccination, and that two-fifths of the admissions consisted of persons who had been vaccinated. Many had the disease severely, and more than twenty of the number died. Recently, parliament has legislated on vaccination and small-pox, but in a way which is neither satisfactory to our profession, nor beneficial to the community.

6. Having now stated, from the history and certain of the results of vaccination, what has been urged against it, and having, when treating of small-pox and of variolous inoculation, noticed what appeared in favour of the latter (see Small-pox, §§ 104—114.), it now becomes a duty to advert to the evidence which opposes what has been advanced both at this place and in that referred to. The facts evincing the failure of vaccination in many cases, and of the impairment of the protective influence of it with the growth of the body, and with the course of time, are here stated, with no disfavour to the practice of vaccination, but with a due regard to what appeared to be the truth as respects the results of this practice. When treating of variolous inoculation, I took occasion to compare the results of it with vaccination, more especially as observed in eastern and inter-tropical countries. Much of the difference and of the difficulty in this matter must be attributed to imperfect, careless, or abortive vaccination, and to the influence of small-pox, when prevailing as a severe or malignant epidemic, on persons thus imperfectly protected.

7. Among the more recent evidence in favour of the protective influence of vaccination, there is none which seems to deserve more attention than that which has been furnished by Dr. Balfour. His deductions have been founded on the returns of the Army, the Navy, and the Royal Military Asylum. But, although these appear very favourable, they are actually not so much so, as a mere glance at the tables he has given might evince; for he adds up the aggregate numbers of the several years to which he refers, and places these numbers opposite to the number of cases of small-pox. It should be premised that soldiers are all protected by vaccination, or by small-pox. Thus, from the returns forwarded annually to the Army Medical Board, during eight years, from the 1st of April, 1844, to the 31st of March, 1851, inclusive, he constructs the following table of cases of, and deaths from, small-pox, out of the *aggregate* strength, or rather the strength multiplied by the years: —

Among troops serving in	Aggregate strength.	Cases of Small-pox.	Deaths by Small-pox.	Annual ratio per 1000 of strength.	
				Cases.	Deaths
The United Kingdom - - -	254,597	557	56	2·188	·220
Temperate Colonies - - -	557,112	160	29	·287	·052
Tropical Colonies	314,131	28	8	·089	·025
Total - -	1,125,840	745	93	·662	·083

8. This table is, however, fallacious, as the *aggregate* here given is not the actual number of different individuals, for the much larger proportion, if not the great majority, of the average number of troops in these eight years (140,730), are actually the same individuals enumerated again and again, or even for several years, unless the discharges and deaths have been remarkably great; whilst the number of cases and of deaths are the total amount furnished during the eight years from among the individuals actually serving; for it cannot be shown that during these eight years the army was formed of 1,125,840 different persons.

9. The fallacy now pointed out exists in the other tables, more especially in that giving the results as respects the Navy, and from it no correct inference can be drawn. His Report, however, of vaccination of the boys of the Royal Military Asylum, is a much more important document, and this I adduce. "Of 5,774 boys taken on

the strength of the establishment from its opening in August, 1803, to the 31st of December last (1851), 1,950 are recorded as having marks of small-pox, 3,636 marks of vaccination, and 188 no satisfactory mark of either. The last having been all vaccinated on admission, there were 1,950 protected by previous small-pox, and 3,824 by vaccination."

	Number over whom observations extend.	Of whom subsequently		Ratio per 1000.	
		Had Small-pox.	Died of Small-pox.	Cases.	Deaths.
Boys with marks of Small-pox -	1,950	12	4	6·15	2·05
Boys with marks of Vaccination -	3,824	27	–	7·06	0·00

It must be presumed that the boys leave the asylum when they reach puberty or manhood, or before this latter epoch. The results subsequently are not known, and cannot well be ascertained; and let it be remembered, that the liability to small-pox, modified or otherwise, then becomes greatest. Nor should it be overlooked, that exposure to the infection of small-pox cannot be as great in garrisons and in an asylum as in the general community. Besides, when a case of small-pox occurs in either garrisons or in an asylum, it is removed to the infirmary, or other places of seclusion; whereas among the public, with few exceptions, a case, whenever it occurs, becomes a focus of infection, from which the disease spreads in all directions amongst the unprotected.

10. There can be no doubt that vaccination, satisfactorily performed, with recent lymph of a proper description — the vesicles having regularly maturated, without hindrance or accident, and with a sufficient number of punctures—is a most valuable protection from small-pox; and if this protection be not afforded during the whole life of the individual vaccinated, in some cases; it at least, in all, is a protection for many years, the variolous disease, when caught subsequently, notwithstanding this protection, being, with few exceptions, a comparatively mild disease — these exceptions, especially when they are fatal, still admitting of doubts as to the proper performance of vaccination, and as to the efficacy of the lymph or matter employed. It cannot, however, be denied, that the protection from small-pox furnished by vaccination to persons who have been vaccinated in infancy, and have grown up, is not so fully manifested when small-pox is epidemic, as at other times; nor does it appear to be as complete when vaccinated persons migrate to warm climates, and are there exposed to small-pox infection, as when they remain in temperate countries: but this requires further inquiry.

11. II. OF THE COW-POX IN THE COW.—This disease is not of frequent occurrence. It appears as an epidemic, and rarely or never unless where cattle are collected together in herds. It then breaks out at irregular periods, and from causes unknown. Dr. JENNER's experiments concerning it were often interrupted by its complete disappearance. Dr. JENNER at first considered that cow-pox in the cow was generally a local disorder confined to the udder; and such it has appeared to be in some, if not in many instances. Subsequent observations, however, have shown that it is really a febrile constitutional disease, accompanied with eruption, although the febrile symptoms are often not very manifest. True cow-pox shows itself on the nipple of the cow, in the form of irregular pustules, or more strictly, as vesicles passing into a pustular state. At their first appearance they are commonly of a pale-blue colour, or rather of a hue approaching to livid, and surrounded by an erythematous or erysipelatous inflammation. They sometimes degenerate into phagedenic ulcers. The animal appears indisposed, and the secretion of milk is much lessened. The cow is subject to other pustular sores on the nipples, which are of the nature of common inflammatory sores, and possess no specific quality. They do not present any bluish or livid tint, or any erysipelatous redness around them. They desiccate quickly, and create no apparent constitutional disorder in the animal. Such a complaint is frequent among cows in the spring, when the calf is suckling. It was called by Dr. JENNER the spurious cow-pox.

12. *Casual cow-pox in man* is caught by milkers of affected cows, and appears on the hands and wrists in the form of inflamed spots, which go on to suppuration, forming pustules of a circular form, having elevated edges, and depressed centres, and are of a colour inclining to blue. After a time absorption takes place, and swellings appear in the oecilla. Fever succeeds with headache, sometimes with vomiting, and in some cases with delirium. The febrile symptoms decline in three or four days; but the sores on the hands often remain, very painful and difficult to heal for a considerable time. No eruption on the skin follows the decline of the febrile symptoms.

13. III. INOCULATED COW-POX. — i. *Regular Cow-pox.* — When vaccination has been successfully performed on a healthy child, the puncture may be felt slightly elevated on the second day; and on the third, and even on the second, a slight efflorescence may be distinctly seen, by the aid of the microscope, surrounding the inflamed point. On the fifth day a distinct vesicle is formed, having an elevated edge and a depressed centre. On the eighth day it appears distended, with a clear lymph. The vesicle on this, its day of greatest perfection, is circular, and either pearl-coloured or slightly yellow. In its form and structure it resembles the pustule of small-pox. Its margin is turgid, firm, shining and wheel-shaped. It is composed of a number of cells, by the walls and floors of which, the specific matter of the disease is secreted. On the evening of the eighth day, an inflamed ring begins to form around the base of the vesicle, which continues to increase during the two following days. This areola, or ring, is circular, its diameter extending from one to three inches. When at its height, on the tenth day, there is considerable hardness and swelling of the subjacent cellular tissue. On the eleventh day the areola begins to subside, leaving, as it fades, two or three concentric circles of a bluish tint. The

vesicle has previously burst, and its surface acquired a brown colour. The lymph which remains becomes opaque and gradually concretes; so that about the end of the second week, the vesicle is converted into a hard round scab, of a reddish-brown colour. This scab contracts, dries, blackens, and about the twenty-first day, falls off, leaving a cicatrix, which is permanent in after life, is circular, somewhat depressed, striated, and indented with six, eight, or ten minute pits, corresponding to the number of cells of which the vesicle has been composed.

14. Slight constitutional disturbance is observed about the seventh or eighth day, or sometimes a little earlier. The child is hot, restless or feverish, and the bowels slightly disordered; but this subsides in two or three days. A few children, however, present no sign of constitutional disorder, which is not by any means essential to the success of the vaccine process. About the tenth day a papulous eruption, of a lichenous character, sometimes appears on the extremities, occasionally extending to the trunk of the body. It continues for about a week, or even lasts after the scab has fallen off. This vaccine lichen is met with chiefly in children of a full habit, where numerous vesicles had been raised on the arm, which discharge freely. It is an accidental occurrence, which, like the constitutional irritation, indicates a full effect of vaccination on the system; neither the one nor the other, however, being deemed requisite to ensure such effect.

15. In adults, vaccination exhibits the same succession of phenomena as in infants. The vesicles, however, are thinner and more easily ruptured. The lymph is usually of a yellowish tinge, and the areola is more extensive. The glands of the axilla frequently swell, which is rarely observed in children; and constitutional irritation is more frequent and greater. Secondary lichen is less frequent and less marked. Dr. Heim, of Ludwigsburg, considers that the adult lymph is more energetic than infantile lymph, but this requires further investigation.

16. ii. *The irregular or anomalous vaccine vesicle.*—The above normal course of the vaccine vesicle is liable to be disturbed in various ways, and by various causes. Imperfect vaccination presents no uniform sign, but exhibits different appearances in different cases, such as pustules, ulcerations, scabs, and irregular vesicles. The *irregular vesicle* is attended at its commencement by urgent itching; provoking scratching or rubbing, to which the subsequent appearances are unjustly attributed. The vesicle throws out a premature efflorescence, and advances too rapidly; so that on the fifth day it has attained its height, when it will be found raised on a hard inflamed base. "It is accuminated, or conoidal, and gives the appearance of a common festering sore produced by a thorn." It is generally of a straw colour, and contains some opaque matter or pus, instead of a clear transparent lymph. The scab produced by it is small, of an amber colour, and drops off by the tenth day.

17. The causes of this abortive or irregular vesicle are not well ascertained. Sometimes the bad quality of the lymph employed may occasion the irregular vesicle, three or four children, or more, vaccinated from the same source, exhibiting the same irregular appearances. Dr. Gregory supposed that it might arise from the influence of weather or season, as he observed it in many more cases on the approach of winter than in the spring or summer. Some believe that this irregularity arises from the use of lymph, taken at too late a period of the disease. But although lymph taken after the tenth day will often fail to reproduce vaccinia, yet when it does succeed, the vesicle goes regularly through its course, and is perfectly effective in preserving from small-pox. Besides the scabs of cow-pox, moistened with a little luke-warm water, will often produce the disease in all its purity.

18. Irregularity of the vaccine vesicle is sometimes attributable to a bad habit of body. "The proof is, that one child only out of many vaccinated with the same lymph, shall show the anomalous form of cow-pox. It is a singular but very important fact, that an imperfect vesicle, the offspring of a perfect one, degenerated by some peculiarity of habit in the individual vaccinated, shall sometimes reappear in all its original purity and perfection, when transplanted into a healthy, well-disposed subject."

19. In some instances the specific inflammation, or areola, is very severe, extends from the shoulder to the elbow, or even invades the trunk, requiring a recourse to cold lotions, active purgatives, and febrifuges. The vesicle, instead of scabbing in the natural way, is converted into an ulcer, discharging freely. The inflammation thus arising is, however, only temporary; and, if it have commenced at its proper period, it does not appear to weaken, or in any degree to interfere with the protective virtue of the vaccination. The vesicle about the fifth or sixth day occasionally becomes scaly; a species of psoriasis taking the place of the areola. In a few other cases true erysipelas supervenes. These anomalies deprive the cow-pox operation of all claim to protective influence. A much more frequent and successful anomaly is retarded cow-pox; the advance of the vesicle being without any apparent cause suspended. The areola does not form before the tenth or twelfth, but ultimately the process is completed, the success of the vaccination being in no degree prejudiced.

20. iii. *Complications of cow-pox.*—A child is sometimes vaccinated after having been infected by *measles* or *scarlatina*, and before their respective eruptions have appeared. In such cases the cow-pox is generally retarded. In a case recorded by Dr. Gregory, it was retarded sixteen days whilst the measles ran their course. Genuine *chicken-pox* (*varicella lymphatica*) will run its course along with cow-pox, without interfering with any of its phenomena. The modifications which cow-pox undergoes when *small-pox* invades the system about the same time are interesting. When vaccination is performed during the incubative stage of casual small-pox, this latter being yet latent, the vaccine vesicle either does not advance, or advances tardily and imperfectly. Sometimes, however, cow-pox and casual small-pox may be seen running their full course in the same person at the same time. In no case, however, does the cow-pox so inserted modify the course of the small-pox. When the variolous and vaccine fluids are inoculated on the same day each disease occasionally proceeds, preserving its original character. In some cases, however, they

mutually restrain and modify each other. The vaccine vesicle in these is smaller than usual and irregular in its progress, while the variolous pustules which follow are of the kind termed *variolæ verrucosæ*, or commonly swine-pock, stone-pock, or horn-pock (See art. CHICKEN-POX, §§ 2, *et seq.*); are hard and shining, surrounded by little inflammation, and suppurate imperfectly; the little matter they contain being absorbed, leaving the cuticle hard and elevated, for some days afterwards. The eruption on the extremities does not pustulate, but is papulous, minute, and terminates by desquamation. Although the eruption be modified in most cases, there is generally considerable disturbance of the constitution under the joint influence of the variolous and vaccine poisons.

21. When vaccination precedes variolous inoculation by a period not exceeding four days, both diseases advance locally. "Sometimes an eruption of small-pox papulæ follows. At other times the variolous fever is slight, and unaccompanied by eruption. Under these circumstances, matter taken from the primary vesicles shall sometimes communicate cow-pock and small-pox respectively; but more commonly the variolous poison predominates, and contaminates the lymph of the vaccine vesicle." Variolous inoculation at any period not exceeding a week from the date of vaccination will take effect and be followed by a pustule: after that time no effect is produced. Dr. WOODVILLE on several occasions inoculated with a mixture of variolous and vaccine matter. The result was not to be depended upon, but in general pure small-pox succeeded. When small-pox inoculation precedes by three or four days the insertion of vaccine lymph, the vaccination advances, but after the tenth day the fluid in the vaccine vesicle becomes purulent, and in that state will communicate small-pox. Those who have undergone variolous inoculation in early life are generally unsusceptible of cow-pox. Vaccination, however, in such circumstances produces a certain degree of effect, the disorder manifesting itself in an imperfect and modified form. The fluid in the resulting vesicles cannot be trusted to for producing the genuine cow-pox.

22. iv. *Recurrent Cow-pox.*—When cow-pox has completed its regular course, the constitution is left, for a very considerable time at least, unsusceptible of the same disorder. But this law does not obtain if the revaccination is performed at very short or at very distant intervals:—(*a.*) At a very *short interval*, or on the fourth, fifth, or sixth day after a regular primary vaccination, the vesicles of the second vaccination are accelerated in their course, so as to overtake the first crop, and the whole maturate and scab together. The second crop of vesicles, however, is not more than one fourth the normal size, and the areola is equally contracted. Mr. BRYCE (*On Cow-pox*, Edin. 1802) ingeniously availed himself of this circumstance, and, by testing by revaccination on the fifth day, he endeavoured to ascertain the full influence and actual security of vaccination. The plan, well known as BRYCE's *test*, has been extensively adopted. To obtain this test in greatest perfection, he advises the revaccination to be performed at the end of the fifth or beginning of the sixth day; and if no acceleration of the second crop of vesicles be observed, it is to be concluded that no constitutional effect has resulted from the first vaccination. The second is then to be regarded as the primary affection, which, in its turn, is to be tested by a third vaccination, and so on until we are satisfied that the constitutional effect has been fully produced. Dr. GREGORY adds, that "some persons have claimed for this suggestion the highest honour, and have even considered Dr. JENNER's discovery as incomplete without it. Dr. JENNER, however, never laid much stress upon it. In doubtful cases, it is a prudent practice, but it has been extolled far beyond its real merits. It shows whether or not constitutional influence has been exerted by the primary vesicle, but it does not determine what has been the degree of such influence,—in other words, it does not show whether the constitutional effect has been *complete* or otherwise."

23. (*b.*) Revaccination at *distant intervals* from the date of primary vaccination, is deserving of notice. Dr. JENNER, in his original essays, stated that the human body, after a time, had the susceptibility of cow-pox renewed. Dr. GREGORY describes four different effects of revaccination at distant intervals:—1st, In many cases, especially if the interval from the primary to the secondary vaccination has not exceeded five years, the skin appears completely insensible to the vaccine matter;—2d, At intervals exceeding ten years, the virus irritates locally. In three, or at furthest four days from insertion, an areola of irregular shape appears around a minute, itching, acuminated, and angry vesicle. The glands of the axilla frequently swell; and in particular habits of body, especially in adult females, irritative fever is superinduced. A scab forms on the eighth day, which soon falls off, leaving no permanent cicatrix;—3d, In other cases, a vesicle forms more gradually, without either local or constitutional irritation; a slight areola succeeds, and the vesicle yields, on the seventh day, a considerable quantity of thin lymph; but this lymph is incapable of propagating the disease;—4th, In this set of cases, the second vaccination runs a perfectly regular course. A circular areola forms on the eighth day, and the lymph propagates a genuine cow-pox.

24. IV. NATURE OF VACCINIA.—*The identity of vaccine and variolous disease.*—When Dr. JENNER announced vaccination as an antidote to small-pox, he was strongly impressed with the idea of the common origin of human and epizootic maladies; and, conformably with this idea, he viewed small-pox as the most remarkable malady which equally affects man and the higher animals; and that this malady, in its less malignant forms, assumes the form of cow-pox, chicken-pox, and swine-pox. This, however, had been long a vulgar opinion, and is somewhat analogous to the view I stated when treating of scarlet-fever, which, I remarked, had appeared within the last three hundred years, and was derived from a similar disease in the horse. JENNER believed not only that small-pox and cow-pox were essentially the same disease, but that the former was a malignant variety of the latter, the parental malady being the cow-pox. This opinion was expressed by the term *variolæ vaccinæ*, the name he gave cow-pox, when first introduced to the notice of the scientific community. The researches of Mr. CEELY have more recently confirmed the intimate connection Dr. JENNER contended for between cow-pox a

small-pox; inasmuch as he has shown that the inoculation of the cow with variolous matter produces in that animal the true vaccine or cow-pox; and that inoculation of the human subject with the vaccine matter thus generated in the cow from variolous inoculation, propagates genuine cow-pox in man. He has further adduced some facts, which, however, require further investigation, but which appear to prove the origin of the cow-pox, or vaccinia, in the infection of the cow by small-pox when occurring epidemically or sporadically in human subjects. Amongst other observations, Mr. Ceely states that he went to examine some cows affected with cow-pox; and that their proprietor, Mr. Pollard, "at the same time, expressed his conviction, *that his cows had been infected from human small-pox effluvia*, to which he considered they had been exposed.

25. The above facts, although scanty as they are, go to prove the following: — 1st, That cow-pox originates in small-pox infection or contagion caught by the cow; — 2d, That the infection of the cow by small-pox gives rise to vaccinia — an eruption which resembles the pustule of small-pox, but which cannot communicate small-pox, although it propagates itself as true vaccinia; — 3d, That, unlike, or differing from, variola or small-pox, vaccinia is not communicated, at least from the cow to man, or from one human subject to another, by an effluvium or emanation proceeding from the affected at any stage of its course; — 4th, That, like variolous inoculation, vaccination is capable, when properly conducted, of protecting from small-pox, with few exceptions, and at least for a considerable time; — 5th, That the amount of evidence favours the opinion that vaccinia is a modification of variola, the modification proceeding from the virus of the latter having infected the cow, and occasioned the vaccine eruption; — 6th, That the amount of evidence also favours the inference that vaccination protects, at least in many instances, from small-pox only for an indefinite time, and that the length of that time is indeterminate or indeterminable; — 7th, That the duration of the protection may depend upon climate and various unascertained circumstances, and that there is reason to infer that, in such cases and circumstances where the protection fails after several or many years, the impairment of the protective influence is gradual, and progressive with the duration of time.

26. From the foregoing it will be seen that, while I believe, with Dr. Jenner, in the intimate connection of variola with vaccina, and with chicken-pox and swine-pox; yet we have no proof that variola has sprung from cow-pox; the evidence being in favour rather of cow-pox, and the other kinds of pox being varieties or species of small-pox, arising out of the passage of this latter malady through the higher of the lower animals — more conclusively of the passage of the variolous morbid pioson through the cow, as respects vaccinia.

27. Such appears to be the relation subsisting between cow-pox in the human subject and in the cow and small-pox; it may next be inquired what connection exists between *vaccinia in the cow* and the *grease in horses*. Dr. Jenner believed that they were both identical, and that cow-pox never occurs in dairy districts, except where there is access to horses; he thereby denied the spontaneous origin of the disease in the cow. Later observations have, however, proved not only the identity of cow-pox and grease, but have shown, at the same time, first, that cow-pox does originate in the cow without access to horses; and, secondly, that cow-pox is communicable to man from the horse without the intervention of the cow, and with nearly equal facility as from the cow itself. Dr. Gregory states that this branch of the theory of vaccination has been investigated with great diligence by Dr. Loy, of Whitby, Dr. Sacco, of Milan, and Dr. De Carro, of Vienna. The last-named author states, "that the matter in use at Vienna from 1799 to 1825 was partly British vaccine, and partly originated from the grease of a horse at Milan without the intervention of the cow. The effect was so similar in every respect that they were soon mixed; that is to say, that after several generations, and in the hands of innumerable practitioners, it was impossible to distinguish what was vaccine, and what was equine." "The whole British settlements," he adds, "were *equinated*; for the first liquid drop sent thither was the second generation of Milanese equine, or greasy matter, transplanted at Vienna." It cannot be inferred that the grease in horses was the origin of variola; and there is as little evidence of the grease having caused vaccinia in the cow, as there is of the latter having produced the former. It is, therefore, by no means improbable, that both vaccinia and grease, being capable of communicating to, and propagating an identical affection, viz., that commonly called cow-pox, to human subjects in endless succession, is variola modified in its manifestations and properties by its passage through these two species of animals. The grease of horses, being proved, or admitted, conformably with the above evidence, to communicate and propagate an affection in every respect identical with vaccinia, the same inferences which I have deduced respecting this latter, apply also to it, if, indeed, this branch of the subject of vaccination be not viewed as still requiring further investigation, more especially as respects the protective influence of the affection propagated from the grease in horses.

28. V. Protective Influence of Cow-pox. — This subject has occasioned much discussion during the last quarter of a century, and more especially during the last few years; and the amount of protection which cow-pox affords against small-pox has been often entertained, but as yet by no means satisfactorily ascertained. — *a*. There are various circumstances which render it most difficult to determine this question; for the idiosyncrasy of some individuals seems to oppose infection by the vaccine virus, either for a time or through life; and, if such an insusceptibility of the disease be admitted, it may be further inferred that, in others, the insusceptibility being less, the vaccine infection may be incomplete, and the protection afforded be proportionately imperfect. It may be conceded that, where the disposition, in the constitution to receive the vaccine infection is either wanting or incomplete, the protection must be equally deficient; and hence, to estimate the protective influence of vaccination, it must be considered, that the process has not been duly completed, and that no protective influence can be claimed from it, unless the vaccine vesicles and the local phenomena proceed regularly, and leave

a cicatrix, as described above. But, independently of the indisposition of the constitution to receive the vaccine disease, or of the disposition to receive it imperfectly, the health of the individual, and the state of the season or weather, may render vaccine infection either abortive or incomplete. It has been proved that attempts to vaccinate have often failed in hot countries, and in the warm localities of temperate climates, during hot and dry states of the atmosphere; and a similar temporary insusceptibility to small-pox inoculation, during the same state of the atmosphere, has been observed. The impaired health of a person also may render him insusceptible of vaccination, until his health is restored; and various unascertained circumstances may have the same effect, either permanently or for a time. It may be inferred, all things being considered, that, where an insusceptibility to vaccination exists, an equal indisposition to small-pox may be expected; but, as a rule, there may be many exceptions to this, and it would be unwise to confide in it.

29. *b.* Besides circumstances more immediately connected with the individual, there are others depending upon the virus itself. The vaccine lymph may be deteriorated by long-keeping, or by a warm and humid, or a very warm and dry atmosphere, if it be even for a short time exposed to these states of the air. It may also be either inert, or imperfect in its operation and constitutional as well as local effects, owing to its having been taken from the vaccine vesicles at a too early, or a too late stage of the process of maturation, as already noticed (§ 17.); or even to its having been too long kept, or to its insufficient protection from the action of the atmosphere. The manner in which the inoculation of cow-pox is performed — or the efficient or imperfect operation of inoculation — may in some way also affect the results. The number of the incisions or punctures, and the actual deposit of the virus within the sphere of the action of the absorbents or veins, may not merely produce either a full and satisfactory effect, or no effect at all, but also an imperfect or an insufficiently protective effect.

30. *c. Imperfect vaccination* has been referred to a variety of causes. It has been very generally supposed that the vaccine virus becomes deteriorated by its passage through numerous human bodies, or that the protective influence is weakened by the length of time, and the long succession of subjects through whom it has been perpetuated, from its direct inoculation from the cow. Of this, however, there appears to be insufficient proof. It has been remarked, that persons who have been vaccinated by Dr. Jenner himself, before deterioration could possibly have commenced, have nevertheless been attacked by small-pox in after-life. A recent writer remarks, that " so far from believing in any deterioration of virus from successive inoculations, there is reason to believe that, by a careful selection of well predisposed children, the pock may even be restored from an imperfect to a perfect state, and by proper care, therefore, may be retained indefinitely in that condition. If children are successively vaccinated from each other, all of whom are from various causes ill disposed to take on the perfect disease, the virus may unquestionably degenerate, and at length wear out altogether. In tropical countries, and in confined localities, such an occurrence certainly takes place, but this is very different from the notion of a virus deteriorated by the mere influence of time."

31. *d. Imperfect vaccination*, as a cause of failure of protection from small-pox, was much insisted on by Dr. Jenner. Vaccination is said to be imperfect when any considerable deviation from the ordinary course of the vaccine vesicles takes place. The deviations from perfect vaccination are imputed to one or more of the following causes:—1st, To spurious matter, or matter taken from the arm at an improper period of the process; — 2d, To an insufficient number of vaccine vesicles; — 3d, To preoccupation of the skin by some disease, in which a fluid is exuded capable of conversion into a scab, such as tetter, scald-head, ringworm, erysipelas, &c.;—4th, To robbing the vesicle incautiously of its contents, particularly when one only has come to maturity;—5th, External violence done to the vesicle, as rubbing or scratching it, especially during its early stages. That causes may, and often do, interfere with the success of the vaccine process, cannot be doubted; but the influence imputed to them cannot be determined; for it has been proved, by very few instances, it should be admitted, that vaccination, which, according to all indications, should have been considered perfect, has afforded only imperfect or only temporary security; whilst, on the other hand, cases in which one or other of the above causes has interrupted the regular process, have notwithstanding afforded perfect security. The instances in which single vesicles have preserved from small-pox, both casually and by inoculation, Dr. Gregory states to be so numerous that no reliance can be placed on the notion which would connect the security of the individual with the number of maturating vesicles. A case of small-pox after vaccination will sometimes occur in a member of a family, all of whom have been vaccinated in the same manner, by the same practitioner, and having similar marks on the arm, and equally exposed to contagion, that one alone having become infected. It should also be recollected that vaccination under the same circumstances, especially of the members of the same family, may, upon exposure to small-pox infection, be followed by this malady, in its various grades of modification, according to the time that has elapsed from vaccination. It has even been ascertained, that persons have caught small-pox after having been subjected to Bryce's test of the perfect constitutional affection of the original vaccination. It should, however, be recollected that these are merely exceptions to the general rule of protection; and as exceptions have attracted greater attention than those which prove the rule.

32. *e. The presumed decadence of vaccine influence and protection* has been believed by many from an early period of the history of vaccination. Dr. Jenner, in his third publication, in 1800, remarked that there were some " who suppose that the security from small-pox, obtained through cow-pox, will be of a temporary nature only. This supposition is refuted not only by analogy with the habits of diseases of a similar nature, but by incontrovertible facts, which appear in great numbers against it." That analogy may be considered opposed to this supposition may be allowed, although the analogy is neither very close nor very conclusive; but "

facts opposed to it were certainly neither strong nor very manifest, inasmuch as time, the necessary element of their manifestation, had not then elapsed. That Dr. JENNER was, however, convinced, or at least most sanguine in this matter, is shown in his petition to Parliament, where he states that his discovery had the "beneficial effect of rendering, *through life*, the person inoculated with it perfectly secure from the infection of small-pox." He rested his arguments as to the permanency of the protection of vaccination upon his belief, which subsequent researches have proved to be well founded, in the identity of vaccinia and variola; but, even granting the identity, a very marked modification of the former from the latter, by the passage of the poison through the body of the cow, must be admitted, the result being the conversion of a frequently malignant and generally severe malady, into a mild disorder. Are we, therefore, from the mere admission of identity thus modified, to infer protection by means of the milder form of disorder? May it not be as justly inferred, that whatever protection is actually afforded by the milder form of the disease may possibly be sometimes overcome by the contagion of the more severe malady? and that the protection of the former, being weaker or milder than that furnished by the latter, may not be so endurable, especially in some constitutions and circumstances, and more particularly if the process of vaccination has not been perfect or complete in all respects.

33. It was admitted by Dr. JENNER, Dr. WILLAN, and others, who believed in the permanency of vaccine protection, that, when the vaccine process has been *imperfectly* gone through, and when, from some peculiarity of constitution, the system receives only a portion of, or is insufficiently imbued with, that protective influence which cow-pox is capable of imparting, then "small-pox would recur, and thus the degree in which its phenomena were modified was proportioned to the degree of perfection which the vaccine vesicle assumed during its development."

34. This partial protection from small-pox, admitted in the circumstances just stated, has, however, been extended by many to the more perfect processes of vaccination; and there are many medical men and others, who believe that the protection is complete only for seven, or ten, or fourteen, or twenty-one years; but that the small-pox caught after vaccination is modified in proportion to the shortness of the time which has elapsed from vaccination; and that, after the longest of these periods, little or no modification is observed. This opinion has manifestly been pushed too far; for it cannot be correctly inferred, that these facts, which have undoubtedly been often observed, especially in certain families and persons, in whom peculiarity of constitution, irregularities or imperfections in the vaccine process and other circumstances, tending to account for the imperfect or non-permanent protection, by any means prove that such imperfect protection exists in all cases, or even in a very large minority of cases. The circumstances which secure the desired protection, or which weaken it, or even destroy it altogether, are as yet not known with sufficient precision, and are such as admit of very different opinions, being undetermined on this very important matter. It need only be inferred that the vaccine process should be studied, so as to secure its perfection as far as possible, and in this state that it should be generally practised with the belief that, although not an undoubted, or an universal, or always a permanent protection from small-pox, it nevertheless proves a permanent protection in the great majority of instances, and that, where the protection fails, it renders in the vast majority the small-pox a comparatively mild disease.

35. It has been attempted to calculate *the proportion of the vaccinated who take small-pox*. On this topic it is impossible to arrive at any approximation to the true result. The degree of severity of a small-pox epidemic, occurring in a community containing many vaccinated persons, may be expected to influence the result. Dr. Crosse, in his account of the variolous epidemic of Norwich, in 1819, stated "that of the vaccinated, not more than one in twenty will be in any way affected by the most intimate exposure to small-pox contagion; and less than one in fifty will have the disease in a form answering to the generally received descriptions of modified small-pox." These calculations may have been justified by the epidemic in 1819; but they cannot be viewed as applicable to other circumstances, and more especially to later periods in the history of vaccination and of small-pox prevalence. This is one of the many instances in which statistics cannot be confided in when applied to disease.

36. VI. SMALL-POX AFTER VACCINATION. — I have adverted to this topic when treating of SMALL-POX (§ 38.), but I may make a few remarks respecting it which were then omitted. Variola, as it occurs after vaccination, is generally a mild disease. The pustules are usually small, hard and tuberculated, few of them maturating perfectly. Yet the small quantity of matter they do contain commonly produces small-pox in others; and the exhalation from the affected also communicates the disease. This modified state or variola is not usually followed by pits or scars. Cases of much greater severity do, however, occur, and even assume the worst or confluent forms, or terminate fatally, as I have observed on several occasions. In some instances, a fatal termination may be imputed to the accompanying or secondary fever of small-pox attacking a delicate or scrofulous frame — or persons advanced in life, of a plethoric habit, or affected by some visceral disease, — or those predisposed to, or actually labouring under, pulmonary or other maladies. In such case the physician perceives the true source of the fatal result, whilst the friends of the patient impute the event to small-pox. Soon after vaccination was introduced, cases of failure were imputed to imperfections in the vaccine process in these cases; and not unfrequently the varioloid disease which followed was so slight as to induce doubts of its nature; and very probably there were sometimes grounds for entertaining the scepticism. But, with the lapse of time, facts, proving the failure of the protective influence, became more numerous, and were observed most frequently amongst adults. Dr. GREGORY, who was for many years physician to the Small-pox Hospital, states that "very few children have been received into the hospital under such circumstances (after vaccination); and those few

have invariably had a mild disease, more allied to chicken-pox than to small-pox: whereas *all* the severe cases, and the greater proportion of the mild ones, have occurred in adults, in whom an interval varying from 10 to 30 years (the average eighteen) had elapsed since the date of vaccination."

37. VII. Operative Measures. — *A. The performance of vaccination* although a simple is a nice operation, requiring much attention to several circumstances. Care should be taken to avoid a failure, as it often causes a delay, or a neglect of the repetition of the operation. Failures arise chiefly — 1st, From the selection of the lymph; 2nd, From the mode of operating; and 3rd, From the constitution or state of health of the individual operated upon. — *a*. The vaccine lymph should be recent, if it can be obtained in this state. It should be perfectly clear and limpid, and the earlier it is taken from the vesicle the better. Lymph may be taken with every prospect of success after the fifth day, and up to the eighth or ninth days. That taken on the tenth day should not be confided in. When vesicles are too often or too roughly opened, on the seventh or eighth day, the serum of the blood may commingle with the lymph, and impair, or even altogether destroy, the efficacy of the latter. A vesicle should always be treated gently. — *b*. The lancet used in the operation ought to be clean and sharp. A vaccinating lancet should have a broad shoulder, as well as a sharp point, to enable it to retain an adequate portion of virus. The skin should be kept tense during the operation, and six or eight punctures be made at convenient distances from each other, and to a slight depth. Provided that a genuine lymph of due intensity comes in contact with the absorbing surface of the cutis vera, it matters not whether much or little blood flows from the punctures. The quantity of blood that escapes depends more upon the child's habit of body than on the operator. A plethoric child generally bleeds freely when vaccinated, but generally exhibits the most perfect appearances as to the effect.—*c*. The child operated upon should be in perfect health. Vaccination ought to be delayed during the existence of any disease — at the period of dentition — when the skin is affected by any eruption — or when the digestive canal is disordered — unless some pressing occasion should require it. The best age for vaccinating is between the third and fifth month after birth, before dentition has commenced.

38. *B. Preservation of vaccine lymph.* — Fresh lymph should always be preferred when it can be obtained; but there is often no other resource than preserved lymph. Being liable to spontaneous decomposition, as well as to other changes too slight or delicate to admit of demonstration, unless in its effects after inoculation, and either impairing or destroying its efficiency, great difficulty has been experienced in preserving it, and more especially in transmitting it to tropical climates in an active state. Dr. G. Gregory states the following to be modes of preserving lymph which are now adopted: — 1. It may be preserved fluid for several days between two pieces of glass, about an inch square, which fit each other accurately. When dry, the lymph will often, if carefully moistened by the breath, propagate the disease. — 2. Vaccine lymph may be preserved on ivory points, shaped like the teeth of a comb. These should be twice dipped in the fluid of the vesicle, and allowed to dry slowly. They should be retained, when used, in the wound or puncture for about half a minute. They are considered very effectual. — 3. The lymph may be kept in a fluid state in capillary tubes, having a bulb at one end. They admit of being hermetically sealed. But to prevent spontaneous decomposition the lymph should be collected in minute quantities only. — 4. Mr. Bryce, in 1802, stated that vaccine scabs may be used for communicating the disease, and it has been ascertained that this is the most certain mode of transmitting cow-pox to warm climates. When about to be used they ought to be rubbed to a powder, and moistened with a little tepid water. When thus reduced to the consistence of thin mucilage, they form an artificial lymph. Punctures should be numerous where the lymph is employed. — 5. Dr. Jenner occasionally used dossils of lint, saturated with the fluid of an eighth day vesicle. These he placed between glasses, one surface of which had a small central cavity; the glasses being tied together, their edges sealed, and the whole covered with sheet lead. Preserved in this manner vaccine lymph will retain its fluidity and efficiency for a considerable time.

39. VIII. Revaccination.—The phenomena presented by revaccination after comparatively short intervals, have been noticed (§ 23.). It, however, becomes necessary to take a brief survey of the practice of this measure after long intervals, with the view of affording a complete protection against small-pox. It having been believed by many medical men, and it having become the popular belief, in several countries, that vaccination, however completely performed, is weakened in its protective influence by the lapse of time, or growth of the frame, a recourse to revaccination has been had, in some countries to a great extent. Dr. Goldson, in 1804, first announced this doctrine, but assigned the remarkably short period of three or four years for the decadence of protection. In France, MM. Caillot, Boulu, Berlan, Genouil, and others both in this and in other countries, supported this opinion, but assigned much longer periods for this occurrence, the time assigned by them varying in the opinions of each from ten to twenty-four years, but they all agreed in believing that the loss of protective power was gradual and progressive. M. P. Dubois endeavoured, in 1826, to refute this doctrine as a general inference, although he admitted the facts upon which the opinions of these physicians were founded. The epidemic prevalence of small-pox soon afterwards in France, Germany, and Denmark, confirmed, by the numbers of vaccinated attacked, the opinion that vaccination lost, after the lapse of a number of years, its powers of protection from that malady. From this period — about 1829—revaccination began to be practised on the Continent, and on great numbers in Germany, Sweden, Denmark, Prussia, and in France. In 1833, it was adopted in the Prussian army, and was performed on 48,047 persons, and was successful in 15,269. In 1834, 16,673 successful cases were obtained in 44,454 operations. In 1835, 15,315 were successful in 39,192 revaccinations. In 1836, in 42,124 revaccinations,

18,136 fully succeeded, and 9,040 presented an irregular form of the eruption. Of 14,048 persons, in whom revaccination failed, 1,569 were successful on the repetition of the operation for the second time. In 1839, 41,481 soldiers of the Prussian army were revaccinated; of this number, the cicatrices of the first vaccination were distinct in 33,225, imperfectly distinct in 5,889, and not detected in 2,367. Revaccination succeeded in 19,249, and was imperfect in 8,534. Similar results have been obtained from revaccination in several of the German states, in Hanover, &c., between the years 1835 and 1842. In France, revaccination has not been much practised, and in England still less. During the reign of Louis Philippe, the Royal Academy of Medicine of Paris was consulted respecting the propriety of having recourse to revaccination. This body were opposed to this measure, as they believed that it would weaken confidence in vaccination. M. Dezeimeris protested against this decision, and was successively followed by MM. Fiard, Hardy, Pressat, and others, who published memoirs on the subject in the French journals. M. Villaret, in 1843, practised revaccination in 401 soldiers of the 7th regiment of dragoons; it was successful in 307; and in 153, who had formerly had *small-pox*, the operation fully succeeded in 97. In a second series of 447 persons, who presented perfect vaccine cicatrices, 402 had cow-pox a second time; and, of 123 persons marked by *small-pox*, 89 presented a successful vaccination. MM. Bousquet, Fiard, Guersant, and Blache, who, in 1828, expressed their belief in the permanent security furnished by cow-pox inoculation, have subsequently altered their opinions, and have practised revaccination in numerous cases; and have strenuously advised this measure, as the only certain means of preventing small-pox, by sustaining the prophylactic influence of vaccinia.

40. In 1845 the Academy of Sciences of Paris published a Report, containing the following conclusions: — 1. The protective influence of vaccination is complete as regards the great majority of the vaccinated, and temporary as respects a small number only; and in these latter it is almost absolute up to the period of puberty. 2. Small-pox rarely attacks the vaccinated before the age of ten or twelve; and it is from this age to thirty or thirty-five that they are chiefly exposed. 3. That in addition to its preservative influence, vaccination endows the constitution with an influence which renders the symptoms of small-pox much milder and of shorter duration. 4. Cow-pox, directly or recently derived from the cow, is attended by a much more intense local phenomenon, and by a more certain and permanent effect than that which has passed through a great number of human subjects; this intensity of local action subsiding after many successive vaccinations. 5. The preservative influence of vaccination appears not to be intimately connected with the intensity of its local effects; nevertheless, in order to preserve the properties of vaccinia unimpaired, it is prudent to renew it as frequently as possible from the cow. 6. Revaccination is the only means we possess of distinguishing the complete success of vaccinia from the less complete grades of protection. 7. Revaccination, however, is not certain evidence that the vaccinated in whom it had succeeded would have been destined to contract small-pox, but merely that it was probably among those that this latter malady was most likely to appear, if they became exposed to its infection. In ordinary times revaccination may be practised after fourteen years; during epidemic small-pox it may be practised after a shorter period.

41. It would appear from the circumstance of so many persons having presented the regular vaccinia after small-pox (§ 39.), as stated above, that the complete development of the local action after revaccination cannot justly be viewed as a certain proof that the successfully vaccinated could have been infected with small-pox, although they might have been infected if they had been exposed to the more concentrated sources of infection. Nor can successful revaccination, nor its failure, be viewed as absolutely indicating a state of constitution, which shall resist the infection of small-pox on all occasions, more especially when this malady is present in an epidemic form, although it may resist this infection on nearly all occasions, or with very few exceptions; these exceptions, however, being a mild or modified small-pox, in the great majority of instances.

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See also the British and Foreign Medical Review, vols. i. 609.; ii. 250, 251.; iv. 223. 392. 547.; v. 207.; vi. 247.; vii. 189. 527.; and in many places, in most of the vols. of this work: see the copious *Index*, forming its xxvth volume.

1. **VAGINA AND VULVA — Diseases of the.** — Affections of the vagina and vulva are as frequently surgical as strictly medical. As, however, certain of them require internal or constitutional means, either altogether or chiefly, in their treatment, they may be viewed as belonging to the latter category, although I can see no just reason for separating the two departments of practice, or for assigning them more to the one than to the other.

2. I. The Vagina is liable to several *congenital alterations*, or vices of conformation. The chief of these are:—1st, Its opening in an abnormal situation; — 2d, Its separation by a partition into two canals; — 3d, Its imperforation; — 4th, Its constriction; — and 5th, Its entire absence. As to either of these, I can add nothing to what will be found in the many excellent recent works on surgical pathology. The *last* of these conditions is of great importance as respects the diagnosis, and the results proceeding from it. It may become the subject of medical investigation as respects especially the retention of the catamenia, and the propriety of an operation, on this account, after due deliberation. The absence of the vagina may be only partial; but even in this case, and when the exact state is ascertained, the question as to the propriety of attempting an operation for the establishment of the canal should not be entertained, unless there be a pressing occasion for having recourse to it, as it may compromise the life of the patient. But what occasions may suggest recourse to a surgical operation in such cases? These are:—1st, Excessive uterine distension from an accumulation of the menstrual fluid;—2d, The supervention of metritis, or peritonitis, or both;— and 3d, Contamination of the circulation from the absorption of a portion of the retained and altered blood from the uterus. This operation has been, therefore, performed successfully by Cabaret, Ventura, Desgranges, Delpech, Willaume, Jefferson, and Coste; but unsuccessfully by Langenbeck, Macfarlane, and Freteau (Velpeau, *Médecine Operatoire*, t. iv. p. 356.). The accumulated menstrual fluid may be discharged, in the urgent circumstances just stated, by puncture either by the rectum or by the bladder.

3. The *diseases* and *organic lesions* to which the vagina is liable, are *inflammations*, *ulcers*, *constrictions*, or *contractions and obliteration*, *tumours of various kind*, *polypi*, *fistulæ*, *cancer*, *prolapsus*, *wounds*, *laceration*, *herniæ*, and *the impaction of foreign bodies*. Several of these belong more to the province of the surgeon than to the physician, or rather require surgical, in addition to medical means.

4. i. Inflammation of the Vagina. — Synon. *vaginitis*, *vaginite*, Fr.

Classif. — III. Class. V. Order (*author in preface*).

5. Definit. — *Heat, soreness, or pain, in the course of the vagina, sometimes attended by increase of pain, or by uneasiness upon sitting down on a hard seat; and always by pain and tenderness on vaginal examination, and by a whitish, or a muco-purulent, discharge, with slight febrile disturbance, increased or returning at night.*

6. Inflammations of the vagina rarely occur, unless in connection with inflammation of the vulva, or with inflammation of the neck of the

uterus; most commonly with both, unless it be *caused* by violence, by excessive sexual indulgence, by irritating injections, and by foreign bodies, as pessaries, &c., lodged in the vagina. It commonly presents an *acute* or *sub-acute form*, whether simple or thus complicated; but it is also often *chronic*, especially when it is associated with disease of the neck or body of the uterus, and in many cases which are commonly viewed as simply those of leucorrhœa. In these *chronic* and *sub-acute* cases, the mucous follicles of the vagina, and often also of the cervix and vulva, are more or less implicated — either partially or chiefly.

7. *A. Acute vaginitis* rarely occurs in a simple or *sthenic form*, unless when it is *specific*, or *gonorrhœal*. In rare cases, also, it is *asthenic* or *diffusive*, owing to the occasions about to be mentioned. *Acute sthenic vaginitis*, and the *sub-acute states*, are most frequently consequences of the causes just stated, or of sitting on cold or damp seats, especially during, or soon after, the menstrual period. In these circumstances, it has been termed, by some physicians, *vaginal catarrh*, or catarrhal inflammation of the vagina, especially in its slighter or sub-acute state. In this state, it is not infrequently met with in pregnancy, and, in rare instances, as a complication of hæmorrhoids. In these simpler forms, vaginitis is attended by a copious whitish, or greyish, or nearly colourless, mucous discharge, which soon passes into a muco-purulent and yellowish matter, especially when retained for some time in the vagina; there are also soreness and tenderness in the course of the vagina, sometimes with frequent micturition and slight dysuria. I have met with several cases, in public and private practice, of this form of vaginitis, as a sequela of measles, but much more frequently of scarlet fever, especially in children among the lower classes.

8. *B.* Acute and sub-acute vaginitis is often mistaken for *gonorrhœal vaginitis*, or the *blennorrhagia* of French pathologists, especially of M. Ricord and his disciples; and it is generally very difficult to distinguish between the simple and specific forms of the disease. Generally, however, the latter, or gonorrhœal, is attended by characteristic signs referable to the vulva; by itching, smarting, or stinging in this situation; by frequent painful micturition, by inflammation and swelling of the labia nymphæ and urethra; pain and soreness being greatly increased when sitting. The local signs and febrile symptoms are more acute, and the swelling, tenderness, and intolerance of an examination are greater, than in the non-specific states of vaginitis, and the discharge more copious and more completely purulent. In all the cases of gonorrhœal vaginitis which I have seen the disease extended to the uterus, and in three to the ovaria. In this form of the disease; the history of the case, especially with reference to the affection of the vulva, and the probability of its being caused by an impure connection, will much assist the diagnosis. In most of the cases which I have seen, the disease was communicated by the husbands of the females affected, the fact of this having been the cause having been acknowledged by the former. In some instances, much difficulty has occurred in the diagnosis, especially when vaginitis has been produced soon after marriage, in consequence of excessive sexual indulgence, and of the states of both the male and female organs previously, and even of the constitution and habit of body of the female. A similar difficulty is sometimes met with in the vaginitis, follicular or mucous, which occasionally appears during pregnancy. In both these circumstances, the discharge may infect the husband, in such a manner as to be distinguished with great difficulty, or not at all, from gonorrhœa in the male. The *urethritis* thus produced on rare occasions, is somewhat different from the specific disease, as far as my observation of a few cases enables me to state. The earlier signs referable to the opening of the urethra, and the distressing chordee characterising, are either wanting, or are slight in the simple urethritis; whilst micturition is neither so painful nor so difficult as in the specific disease. The inflammation, however, of the former is more disposed to extend to the mucous surface of the urinary bladder, and less disposed to affect the testicles, than that of the latter malady.

9. *C. Asthenic vaginitis*, or diffusive inflammation of the vagina, has been hitherto unrecognised. I have referred to two instances of its occurrence associated with adynamic dysentery in married females, when treating of *metritis* (see art. Uterus, § 54.), the inflammation having extended from the vulva to the vagina and uterus; and having been produced by the septic and infectious exhalations evolved, during a long continuance of warm weather, from full, open privies. In these cases, the vaginal discharge was muco-purulent, streaked and discoloured with blood, and rusty, at times of a brownish, or greenish brown hue, and very abundant, with remarkable swelling and tenderness of the parts, and with the symptoms accompanying acute metritis (see Uterus, §§ 55, *et seq.*). The pulse was rapid, weak, small, and compressible; the vital prostration and the other symptoms of adynamia being so marked as to require powerful tonics and restoratives. Recovery ultimately took place, but after a very protracted illness. This form of Vaginitis may be complicated with asthenic dysentery, as observed in the cases now referred to.

10. *D. Phlegmonous inflammation* may attack the connecting cellular tissue of the vagina, especially that between the vagina and rectum, and occasion a small abscess which may open either into the vagina or into the rectum. Inflammation also of some portion of the pelvic cellular tissue, or of the cellular tissue connecting the uterine appendages (see Uterus, § 122, *et seq.*) may extend in this direction, and open into the vagina, occasioning more or less inflammation of this part or of the rectum, or even a fistulous communication between the vagina and rectum. When the inflammatory action is limited to the cellular tissue of the vagina and its immediate vicinity, and occasions only a small abscess between the vagina and rectum, the opening into either part is generally followed by quick recovery, unless the constitution be in fault, and then ulceration, or a fistulous communication between the vagina and rectum may result.

11. *E. Consequences of Vaginitis.* — *a. Contraction* and *Obliteration* of the vaginal canal is seldom observed, the latter especially. Either of these lesions may, however, occur after inflammations caused by injuries, wounds, lacerations, ulcerations produced by pessaries, foreign bodies, and irritating injections; but contractions in va-

rious grades and extent are much more frequent than obliteration, which is a very rare occurrence. Injuries or lacerations during delivery are the most frequent causes of these lesions. The injection of irritants and stimulants to provoke abortion has in a very few instances been recorded as causes of both contraction and obliteration of the vaginal canal. These changes may occur in any part of the canal, but most frequently in the part next to the vulva, unless when they are caused by malignant disease, and then they generally commence in the cervix uteri, and extend to the portion of the vagina adjoining, and progressively to more or less of this canal. In the Article Uterus (§ 205.) I have mentioned a case where nearly the whole of the vagina was obliterated by cicatrisation consequent upon a rare instance of the spontaneous cure of malignant disease of the cervix uteri and vagina. Similar occurrences have been noticed by Rokitansky.

12. *b. Chronic inflammation*, limited or more or less extended, sometimes either follows the acute and subacute states of vaginitis, or occurs primarily, but much more frequently as a consequence of the irritation caused by morbid secretions from the cervix uteri, or from the internal surface of the cervix or body of the uterus, and it is often complicated with inflammation of the cervix. This form of the disease may occur either in the puerperal or in the non-puerperal states, and it may, moreover, be complicated with, and then be masked by, the uterine disease, or by inflammation of the vulva, or by the leucorrhœal discharge, with which it is attended, both in its simple and complicated forms. Chronic inflammatory irritation, thus originating and related, may be followed by organic changes of an important nature, especially when it more particularly affects the mucous follicles, or extends to the connecting cellular tissue. In such cases, *ulcerations*, and even *perforations*, of the vagina are not very rare occurrences. The *ulceration* may be *common*, *scrofulous*, *syphilitic*, or *cancerous*. The first of these usually occurs in consequence of inflammation, chiefly of the phlegmonous character noticed above (§ 10. *et seq.*), and commences either in the mucous follicles, or in the connecting cellular tissue. In these follicles, scrofulous ulcerations may also commence, or be chiefly seated. These latter have been well described by Dr. Carswell; and Dr. Hooper states that these ulcerations assume the character of scrofula in other parts. "The sides of the ulcerations are tumid: solid puriform depositions are found about them in the cellular structure between the membranes; and there are perhaps fistulous communications with the urinary bladder, rectum, or psoas muscle." Common and scrofulous ulceration may be developed either primarily or consecutively in the lacunæ and glandular bodies with which the lower part of the vagina is so abundantly supplied. When these glands are primarily affected, there is generally an abundant milk or cream-like discharge from the vagina, constituting a form of leucorrhœa, and depending upon chronic irritation or inflammation of them. This state of morbid action when prolonged, especially in cachectic or scrofulous constitutions, may go on to ulceration, or even to fistulous perforations. Disease of these glands, and chronic inflammation of the vaginal surface, may also be developed or perpetuated by the morbid secretions from an inflamed or otherwise diseased cervix uteri, or internal surface of the uterus, or of its cervix. The most extensive ulcerations and perforations with fistulous communications with adjoining parts are produced by pessaries or other foreign bodies lodged in the vagina. Syphilitic and cancerous ulceration of the vagina are noticed in the articles on Cancer of the Uterus and on Venereal Diseases.

13. *Complications of Vaginitis.* — Acute or chronic vaginitis may be associated with inflammation of the cervix uteri, or with vulvitis, or urethritis, or even with two or all of these. It is chiefly in girls under twenty that the complication with vulvitis is observed. In some instances of this complication, an abscess forms in the labia majora, especially when inflammation of the vagina and vulva is severe; and when the inflammation extends to the subjacent cellular tissue of cachectic habits, phagedena of the parts may supervene. Gonorrhœal vaginitis is generally associated with urethritis and vulvitis, and often also with sympathetic bubo, this latter being the consequence of inflammation of the lymphatic vessels and glands. Vaginitis is, in some cases, complicated with endo-metritis, and more rarely also with inflammation of the uterine appendages, especially when it is of a specific kind, as noticed above (§§ 8, 9.). In this complication the inflammation may originate either in the uterus, or in the vagina, and extend to the other parts. Vaginitis may also occur during pregnancy, and disappear after parturition.

14. ii. Treatment. — The treatment of the non-specific or common states of inflammation of the vagina is generally simple, and is locally and constitutionally antiphlogistic. In severe attacks, leeches should be applied to the upper parts of the insides of the thighs, or to the groins, or perineum, and the bleeding be promoted by warm fomentations, &c. Tepid or warm baths, general or local; cold, tepid, or warm injections into the vagina; cooling aperients, and cooling diaphoretics, and an antiphlogistic regimen, are the chief means of treatment, especially in the more acute cases, and in the early stage. Aperients which irritate or excite the large bowels should be avoided; and those injections, alvine and vaginal, which produce a cooling and an emollient effect, not only on the large bowels, but also on the vagina, should be selected. The injection of cold or tepid water into the vagina washes away the morbid secretion, which by remaining even for a short time, and accumulating in this part, increases or perpetuates the inflammatory irritation. Several medicated injections, either emollient, astringent, or anodyne, may also be prescribed. When the irritation, tenderness, or pain, is considerable, milk-and-water, linseed tea, decoction of marsh-mallows, either tepid, or cold, may be administered, with a little syrup of poppies, and with either a small quantity of the nitrate of potash, or of the biborate of soda. If the inflammation be severe, the emollient injections may contain either these in somewhat larger quantity, or a small quantity of the hydro-chlorate of ammonia. Or instead of those the decoction of poppy-heads may be employed, with the saline substances just mentioned, or simple water with the acetate of lead and a few drops of laudanum.

15. When the more acute and severe sym-

ptoms have subsided, then the more energetic astringents may be prescribed, such as the sulphate of alumina, the sulphate of zinc, acetate of lead, solution of the nitrate of silver, decoction of oak-bark, and solution of tannin. Dr. H. BENNET states, that the first three he generally uses in the proportion of a drachm to a pint of water, increasing or diminishing the strength according to circumstances; and after much experience he concludes that alum is the most efficacious of all these agents, with the exception of nitrate of silver. In order that injections may be efficacious, they should be administered abundantly, frequently, and with such appliances as may allow them to remain for some time in the vagina.

16. For *gonorrhœal vaginitis*, the antiphlogistic treatment advised for the early stage of common or simple vaginitis should be energetically prescribed, and cooling diaphoretics and aperients, with demulcents, emollients, and diluents, freely used. The irritation of the urinary bladder and urethra, and the associated vulvitis, will be most surely allayed by these means, aided by fomentations, warm local and general baths, and by the emollient and anodyne injections advised above (§ 14.). The patient should partake freely of mucilaginous diluents containing the nitrate of potash or of soda, and the carbonates of the fixed alkalies, with very small doses of camphor. After the acute symptoms have been subdued, the more astringent injections mentioned above may be resorted to. If gonorrhœal rheumatism should occur, which is seldom observed in females, the treatment for that species of rheumatism, advised in the article RHEUMATISM (§ 163.), should be directed. Gonorrhœal vaginitis extending to the cervix uteri, or occasioning endometritis, requires the means advised for this complication in the article UTERUS (§ 124.).

17. *Asthenic vaginitis*, in the form which I noticed above, as having fallen under my observation, requires a frequent recourse to vaginal injections. Those which I prescribed consisted of alum, or of sulphate of zinc, with a little camphor and laudanum; the decoction of cinchona, with the compound tincture of cinchona, nitrate of potash, and bicarbonate of potash, being taken internally; and full doses of DOVER's powder at night; lime-water or potash-water, with milk, being the beverage generally allowed.

18. As regards *other lesions* implicating the vagina, especially *ulcers*, *fistulæ*, *lacerations*, or extensive *ruptures*, *wounds*, *herniæ*, *polypi*, *tumours* of various kinds, *foreign bodies* lodged in the vagina, *prolapsus* of the vagina, and *cancer* of the vagina (see art. UTERUS, § 190. *et seq.*). I must refer the reader to surgical works, or to the article VAGINA, by MM. DESORMEAUX and P. DUBOIS, in the second edition of the *Dictionnaire de Médecine*, where these lesions are very ably described.

19. II. THE VULVA is liable to diseases which are either local or constitutional. The latter requires internal or constitutional treatment chiefly, and sometimes local means also; the former seldom receives permanent benefit from local appliances, without having recourse at the same time to general or internal medication. The affections of this part, as well as of several others, show that no distinction should be made respecting those which are commonly called medical, and those which are usually termed surgical; although I am obliged, by the scope and limits of this work, to observe this distinction to a considerable extent. Diseases of the vulva are of frequent occurrence at all ages and in all cases of society. They often assume serious characters, owing to concealment, neglect, or delicacy of feeling, more especially in childhood, or in early or mature age. They most frequently proceed from want of due cleanliness, from infection, from eruptive and other fevers, from diseases of the uterus and appendages, and from masturbation. The puerperal states have also some influence in causing them. They may occur primarily, or consecutively; and in either case they may be simple, or complicated with whatever disorder they may induce, or be induced by.

20. i. INFLAMMATIONS OF THE VULVA — *Vulvitis.* CLASSIF. — III. CLASS, V. ORDER (*Author*).

21. DEFINIT. — *Pain, soreness, and tenderness of the vulva, frequently with swelling, painful micturition, and more or less symptomatic fever.*

22. *Vulvitis* may assume every grade of severity, from the slightest pruritus and inflammatory irritation, to erythema, to phlegmonous, diffusive erysipelatous, and to ulcerative or gangrenous inflammations, simple or complicated. I shall briefly notice these, as well as other forms of disease of the vulva which fall under the category of inflammatory, either sthenic or asthenic, and offer some remarks on these varieties of vulvitis which have fallen under my observation at the Infirmary for Children and in private practice, and commence with the slightest or least inflammatory in appearance, and proceed to the more violent and dangerous.

23. *A.* CATARRHAL VULVITIS. — This form of the disease is usually slight, unless it be neglected or aggravated by neglect of cleanliness. It is not infrequent in children; and in grown-up females it occurs as a form of leucorrhœa, or as a symptom of disease of the neck or body of the uterus. In infants and children especially, it assumes a catarrhal appearance, the discharge being at first chiefly mucous, and afterwards muco-purulent; the surface of the vulva being slightly red and swollen; but neither very irritable nor excoriated, unless neglected. It is most frequently caused by cold, by sitting on cold or damp seats, by general debility, and the irritation of ascarides in the rectum, or by disorder of the digestive organs. It is sometimes a sequela of low and eruptive fevers in childhood, especially of scarlet fever; and if it be overlooked, or continue long, it may give rise, especially if aggravated by filth and an improper regimen, to one or other of the more serious forms of vulvitis about to be described.

24. *B.* IRRITABLE VULVITIS. — As observed in some states of the disease of the uterus, so in some affections of the vulva, the inflammatory appearances are either slight, or not very remarkable; yet the pain and tenderness are very great, or even acute. Sensibility is so morbid as not to admit of the slightest touch; and in married females sexual intercourse cannot be endured. On examination, the parts are slightly red, or rose-coloured, and covered in parts by a whitish exudation, especially about the entrance of the vagina; in some cases there is also slight swelling or fulness of the labia. The patient

complains of a sense of heat, or lancinating pains of the parts, of smarting painful micturition, and of inability of walking. This complaint is sometimes caused by the state of the menstrual discharge, and is most frequently met with in young persons about the age of puberty, or shortly before or after the first appearance of the catamenia, in females after marriage and during their first pregnancy, and in widows, but less frequently in these last. It is sometimes associated with one or other of the forms of hysteria, or with spinal irritation.

25. *C.* Pruriginous Vulvitis. — *Pruritis* of the vulva is often a very distressing disorder. The itching or pruritus of the parts is sometimes such as cannot be endured without resorting to friction in some way or other to allay it. There is generally a sense of heat, but seldom much pain, tenderness, or soreness of the parts, unless what may be caused by the frictions resorted to. Nor is there much redness or swelling, unless such as may be referred to the same cause. But there is obviously more or less vascular erythism of the parts, or of others in their vicinity, sometimes with increased secretion from the surface or interior of the labia and orifice of the vagina, or even a more copious discharge, owing to the frictions resorted to. This disorder is not infrequent previously to or after puberty, and often is attended by inordinate sexual desire, amounting in some instances to nymphomania, and frequently suggesting masturbation, which, although it may assuage the irritation for a time, generally tends to perpetuate or aggravate the disorder. Pruritus vulvæ is also a frequent consequence of pregnancy, especially of the first pregnancy, in young plethoric habits, and sanguineous temperaments, of the discharges after parturition, and of morbid states of the catamenia. In both girls and married females, it is often caused by the state of the secretions from the follicles of the vulva and vagina, especially when they are allowed to accumulate and irritate, owing to their alteration by the oxygen of the atmosphere, the sensitive mucous and erectile tissues of these parts. It is also, at all ages, sometimes symptomatic of worms, especially of ascarides in the rectum.

26. *D.* Eczematous Vulvitis. — An eruption of an eczematous character (see art. Eczema, § 9.) is sometimes met with on the internal or external surface of the labia vulvæ, and is either dry or humid, and occasionally extends to the adjoining parts of the thighs. It generally presents a copper-coloured redness, is liable to recur at intervals, and often continues for an indefinitely prolonged time. It is attended by a sense of heat or burning, with a stinging itching. It seldom occurs in young females, but is very common after 35 or 40 years of age, and especially after the cessation of the catamenia; and in those it may continue for years, particularly in females of a full habit of body, or who are corpulent. It is not necessarily connected with any venereal infection, or with leucorrhœa, although this latter may be associated with it.

27. *E.* Erythematous Vulvitis. — The internal surfaces of the labia are not infrequently slightly swollen, diffusely red, painful and smarting, and intolerant of touch. It presents no appearance of phlyctena, is smooth or shining, the surface being hot, with a sense of more or less of painful heat. It soon becomes covered by an exudation of a whitish or ichorous lymph; and in some cases which I have seen at the Infirmary for Children, the labia have become adherent, and so firmly adherent, as to require surgical aid in separating them. This form of vulvitis is not uncommon in children of all ages, especially in those of a very full habit of body, and in these, as well as in corpulent females advanced in life, is owing to the acrimony of the secretions from the parts in their vicinity, to the state of the menstrual discharge, or of the lochia, and to the neglect of cleanliness. In many cases the discharges from the vagina, and cervix and os uteri, occasion or perpetuate the inflammation of the vulva. Although a comparatively slight disease, the neglect of it may be followed by more serious results; such as phlegmonous or suppurative inflammation, by inflammation of the lymphatics, or even, in rare instances, in young children, by adhesions of the labia.

28. *F.* Erysipelatous Vulvitis. — This form of vulvitis generally resembles the erythematous at its commencement; but owing to the state of the secretions producing it, or the habit of body of the patient, or to both, it is soon characterised by great swelling, and a disposition to terminate in suppuration, or sphacelation of the more superficial parts. It is attended by a quick pulse, and by more or less severe constitutional disturbance. This often becomes a serious disease, and goes on to *diffuse phlegmon*, or phlegmonous erysipelas. In the most unfavourable cases, particularly in cachectic habits, it is liable to occasion gangrene of the integuments, extending even to the adjoining parts. It results most frequently from the same causes as the foregoing varieties of vulvitis acting on cachectic habits of body, and during morbid conditions of the circulating fluids.

29. *G.* Pellicular Vulvitis. — Since M. Bretonneau described inflammation of mucous surfaces with the exudation of lymph — forming a false membrane over the inflamed surface — a form of disease which he termed *diphtheritis* — inflammation of the vulva with the formation of a false membrane — *Vulvitis diphtherique*, of French pathologists, has been occasionally observed in circumstances similar to those which occasion this form of inflammation in the cavities of the mouth, pharynx, &c., or when this disease of the mucous surfaces is endemic or epidemic. This form of vulvitis differs from all others in the rapid formation of a false membrane on the inflamed, but very slightly swollen, surface. As it is observed in the mouth and pharynx, so it is found to extend to the adjoining canals, advancing up the vagina to the neck of the uterus, or into the urethra. This state of the disease is obviously the result of constitutional disorder, in which the circulating fluids are in some degree, although not always demonstratively, affected. It is most frequently observed in girls or young females, at certain seasons, or localities, of a cold and humid description; and the febrile disturbance attending it presents an asthenic, rather than a sthenic character.

30. *H.* Phlegmonous Vulvitis. — Inflammation of a phlegmonous form may commence either in the cellular tissue beneath or connecting the mucous and cutaneous structures, or in the more deep-seated mucous follicles of the vulva,

or at the commencement of the vagina. It has been assigned to one or other of these seats exclusively by various pathologists; and it may very possibly originate in either, although most probably in the mucous follicles in consequence of obstruction in their ducts. This affection generally appears with heat and tension of the parts, followed by a dull and sometimes a severe pain, and affects chiefly, or more frequently, the lower halves of the substance of the labia majora. Pain, and a sense of weight, tension, and fulness, extend to the perineum, and more or less febrile disturbance is developed, which may, in the course of two or three days, assume a severe inflammatory character. The bowels are confined, and the urine scanty, high-coloured, and passed with pain. The whole vulva becomes hot, and one or other of the labia is thickened and swollen, the inflammation and tumefaction extending near to the perineum. In the course of five, six, or seven days, an abscess commences in the centre of the inflamed tissues; and although it cannot be perceived externally, it may be felt by firmly grasping, between the fingers of one hand, the swollen labium. A tumour, the size of an egg, or smaller, will then be found in the midst of the tumid structure; and if the abscess be at all advanced, fluctuation will be perceived by a finger of the other hand.

31. *Abscess of the vulva* occurs only on one side at the same time, and very rarely attacks both in succession. It is observed chiefly in young females, and especially in the recently married, and very rarely at a greater age than 40 years. M. Velpeau met with a case in a female aged 44. I was consulted in a case of a lady who admitted her age to be 45. This distinguished physician states, that it is commonly a result of excessive coition, of disproportion between the sexual organs, or of the introduction of a foreign body into the vagina; that it may also arise from neglect of cleanliness, from irritation of any kind, whether externally and mechanically, or internally and pathologically; and that in 18 cases out of 20, it occurs in girls who have prematurely had sexual intercourse, in prostitutes, and in young females who have indulged in excessive venereal pleasures or in masturbation. It is sometimes a consequence of leucorrhœa and of gonorrhœa, and of any violence or irritation to which the vulva has been subjected.

32. The *course* of abscess of the vulva is generally rapid; but owing to the structure of the parts, and to the circumstance of females being aware of the cause of the complaint, medical advice is deferred as long as possible; and the history of the early symptoms and changes is not obtained until the abscess has either burst, or is ripe for opening. When left to itself, it generally bursts from the seventh to the twelfth or thirteenth day; when it has acquired a size varying from that of a nut to that of a hen's egg. It rarely exceeds this latter size. Phlegmonous vulvitis very rarely *terminates* in resolution, and seldom in sphacelation or gangrene, and then only in cachectic habits of body. When abscess of the vulva opens spontaneously, it is generally by a perforation in the direction of the vaginal surface of the labium. In some instances more than one perforation is observed when the abscess has been large. A fistulous communication may even form, and, in rare cases, extend to the rectum, or by the side of the vagina to or around the urethra. In most cases, however, the abscess is discharged and healed in the course of a week or two. But if sexual intercourse take place during this period, the abscess may be reproduced owing to the injury or irritation of the cicatrix, and of the tender parietes of the former abscess, and to the greater susceptibility of the parts. Hence abscess of the vulva may be reproduced several times in the same female. M. Velpeau has seen it thus recur six, eight, or ten times in the course of a few years.

33. *I.* Ulcerative or Asthenic Vulvitis. — *Noma, Phagedenic ulceration of the labia vulvæ, Gangrene of the vulva, Gangrenous inflammation of the vulva.* Velpeau. — This form of vulvitis is observed chiefly in children from about the period of weaning to the ninth or tenth year of age. It was first described by Mr. Kinder Wood, and occurs chiefly in ill or insufficiently fed children, in those who live in low, unhealthy, or crowded localities or apartments; or who are the subjects of low, adynamic, or gastric forms of fever; and in delicate, cachectic, and anæmic habits of body, especially in large manufacturing or other cities and towns. The disease may be preceded, as well as attended, by loss of appetite, nausea, thirst, and other febrile symptoms of an adynamic character. The pulse is quick, small, or weak; the countenance and general surface pale or sallow, and the tongue is pale and covered by a dirty-looking or clayey coating or fur. The patient first complains, locally, of painful or scalding micturition; or cries or struggles violently when voiding the urine. The labia vulvæ are inflamed and enlarged, and their surfaces are of a purple, or livid-red tint, the inflammation extending over the clitoris, nymphæ, and hymen, and even into the urethra. A thin exudation may at this early period be observed covering these parts, which may proceed from the irritation having extended to the lower part of the vagina. Twenty-four hours hardly elapse until a number of small vesications appear within the labia, as well as externally, and soon afterwards burst, quickly spread into each other, and form large ulcers. In other cases the inflamed surface passes into the ulcerated state without any manifest vesication. The thin exudation mixes with the secretion from the ulcerations; the resulting discharge is dark-coloured, sanious or ichorous, copious, very offensive, and irritating to the tissues, — and rapidly extends the disease to the perineum and anus, and to the thighs contiguous to the labia.

34. The constitutional symptoms are now most seriously adynamic. The pulse is rapid, irritable, and compressible; the face and general surface are white or blanched; the bowels torpid and the stools offensive. The patient lies constantly on her back, with the knees bent and wide apart; and the distressing pain caused by micturition prevents her from using any effort to void the urine. The ulcerations vary in appearance and depth. In some cases they are foul and deep, in others they are superficial, and their bottoms present small red granulations; their states varying with the severity, constitutional tendency, and the treatment of individual cases.

35. The *terminations* of the disease also depend much upon the circumstances just now stated. When the ulceration is fully established,

the swelling of the labia vulvæ diminishes, and the redness disappears with the extension of the ulceration, which is deep, foul, and spreading, in states of the system manifestly adynamic and cachectic, and of the circulation not only anæmic, but also contaminated. The secretion from the ulcerated surface extinguishes the vitality in succession of the tissues with which it is in contact until the external organs are progressively destroyed. As the process of destruction advances, the face becomes more blanched, the pulse remarkably rapid and small, the appetite lost, the bowels loose, the stools offensive; emaciation and anæmia being remarkable, and the discharge from the ulcerated surface most offensive; and the patient expires in the course of a few days, the duration of the disease varying much with the circumstances and treatment of individual cases.

36. If, however, this affection be seen early, and be judiciously treated, the ulcerations become clean and heal. Yet, after they heal, a yellowish discharge often continues for a considerable time from the vagina and affected parts; and causes, where due precautions are neglected, a recurrence of the malady. In most cases, owing chiefly to the extent of the constitutional disturbance—to the low grade of vitality, and to the contamination and insufficiency of the blood—the recovery of the patient is generally protracted, and is rarely of less duration than eight or nine weeks. When the ulceration is large and deep, the patient very rarely recovers, although the most decided means to arrest its progress be employed.

37. The *nature* and *morbid relations* of this most dangerous form of vulvitis, are manifest from the above. It has been viewed by M. VELPEAU as a gangrenous inflammation of the vulva; but the destruction of tissues quickly following the vesications on the inflamed, swollen, and livid parts, is not altogether similar to true gangrene, but rather to that of phagedenic or rapidly destructive ulceration. It resembles in most respects *cancrum oris*, or that form of stomatitis which I have described by the name of *stomatitis phagedænica* (see art. STOMATITIS, § 24. *et seq.*). The causes of both maladies are the same,—they are both consequent, in rare instances, on low fevers, continued, remittent, and exanthematous, more especially on scarlet fever,—and they are both arrested when admitting of this termination by the same or similar means.

38. *K.* GONORRHŒAL VULVITIS.—*Specific Vulvitis.*—This form of the disease, if not always, is generally attended by more or less irritation of the urethra. The following is nearly the description of the disease, by M. RICORD, as quoted in Mr. ACTON's able work. This complaint may affect the epithelium of the mucous surface only, or the vulvar glands also, these glands, according to M. MOULINIER, being regarded as the organ secreting the venereal veins. At first the patient complains of an unusual sensation in the vulva, with a desire for sexual intercourse. This is soon followed by itching, heat, redness, and swelling. The normal moisture of the parts is much augmented; but it soon becomes increased and irritating, and aggravates the inflammation. The discharge rapidly assumes a muco-purulent state, owing to the affection of the mucous follicles. As the inflammation extends more deeply, the swelling increases; and it may then become phlegmonous (§ 30. *et seq.*), or be attended by œdema. If the nymphæ become inflamed, they may be so enlarged as to protrude beyond the labia. Abscess may follow the swelling, or the inflammation may extend to the vulvar glands, and occasion small abscesses. Owing to the extension of the morbid action to the urethra, and to the state of parts now described, the urine is voided frequently, and produces much scalding and smarting. Patients who have been subject to leucorrhœa readily distinguish the difference between the discharge and other symptoms now experienced, and those to which they have been subject. With very exaggerated sensibility of the vulva, the scalding on passing urine becomes very severe, and in some cases retention of urine occurs. The inflammation may even extend along the urethra to the neck of the bladder, producing very painful and constant desire of micturition. The existence of urethritis in these cases may be ascertained, if the patient has not recently passed water, by introducing the finger into the vagina, and then pressing the urethra from behind forwards; if muco-pus be in the urethra, it will be at once evident. *Syphilitic ulceration* of the vulva is noticed under the head of VENEREAL DISEASES.

39. *L.* CONSEQUENCES OF VULVITIS.—These are, as partially noticed above, œdema, abscess, ulceration and molecular gangrene, sphacelation, extension of the inflammation to the vagina and cervix uteri, or to the urethra and neck of the bladder, or to the lymphatics and lymphatic glands. Œdema vulvæ, although sometimes caused by inflammation, is more frequently a consequence of organic disease of the heart, or of the kidneys, or of other internal organs; and it is thus generally associated with anasarca. It may also occur during the advanced stage of pregnancy, or even after parturition; in the former circumstances often rendering delivery more serious or complicated, and in the latter increasing the amount of suffering, and delaying recovery. Inflammation of the lymphatics and their glands rarely occurs in the course of vulvitis, but chiefly of the phlegmonous, ulcerative, and specific forms. It is seldom detected until pain and swelling are experienced in the inguinal glands, and then irregular streaks of redness may be perceived in the external parts, with irregular hardness or swelling of the labia, extending superficially to the groins.

40. ii. TREATMENT.—*A. The treatment of catarrhal vulvitis* (§ 23.) consists chiefly of frequent ablutions with weak solutions of alum or sulphate of zinc, or with camphor-water, or sea-water, &c. If the parts present much inflammatory irritation, the local means advised for the *irritable* and *erythematous states* of the complaint may be directed, and the treatment be in other respects the same. In most cases, and especially when connected with debility, or occurring as a sequela of fevers, &c., then warm salt-water bathing, followed by tepid, or cold salt-water bathing; or warm salt-water hip-baths; tonics internally, chalybeates, due attention to the digestive, assimilating, and excreting functions, and change of air, &c., will be found of very great service.

41. *B. Irritable Vulvitis* (§ 24.), *Pruriginous vulvitis* (§ 25.), and *Erythematous Vulvitis* (§ 27.), are so closely allied states of inflammation, and so generally affect only or chiefly the epithelial mucous surface, as to require

the same or very similar means of cure. At first emollient or demulcent lotions, containing a sedative or narcotic tincture, or solution, in small quantities; or weak solutions of the acetates of lead, or of the nitrate of potash, or hydrochlorate of ammonia, in the decoction of poppies; or a saturated solution of the bi-borate of potash, in camphor-water, or in the decoction of marsh-mallows; or cooling pomades, as cold cream, &c., may be prescribed. In the more obstinate or severe cases, pomades containing the oxyde of zinc, or the chloride of mercury, &c.; or lotions with a small quantity of the nitrate of silver, or bi-chloride of mercury, or of the sulphate of zinc. Or demulcent applications, containing camphor, with one or other of the substances just mentioned, may be resorted to. As these several forms of vulvitis are often symptomatic of disease of some adjoining organ, more especially of inflammatory irritation of the neck of the uterus, of leucorrhœa, of the irritation of worms in the rectum, of gravel or calculi in the bladder, &c., these morbid relations of the forms of vulvitis, now being considered, should not be overlooked; and the treatment ought to be directed more especially to the cure of the complaint of which they are severally a symptom merely,—but a symptom which also requires removal.

42. C. *Eczematous vulvitis*, or eczema of the vulva, may be treated by similar means to those now recommended, or by the local and constitutional remedies mentioned in the article ECZEMA (see § 16. *et seq.*).

43. D. *Erysipelatous vulvitis* is often a serious disease (§ 28.), and arises from the same, or nearly the same, causes as those producing the erythematous variety. In most of the cases of the former, however, the constitution is more in fault, especially the circulating fluids, than in the latter. The treatment, therefore, of this form should be more energetic, and be directed chiefly with the objects of depurating the blood, and supporting vital power and resistance. The former intention will be fulfilled by the exhibition of a smart emetic at an early stage, followed by a mercurial purge, and by saline aperients and depurants. After the primæ via has been sufficiently evacuated, tonics should be conjoined with the alkaline carbonates, and such local means resorted to as the state of the parts may suggest. If diffusive phlegmon, or abscess, or gangrene supervene, the constitutional treatment should be energetic, and the local measures the same as advised for the phlegmonous and phagedenic forms of the disease (§§ 45, 46.), especially scarifications and incisions, which, when practised before suppuration or sphacelation commences, often prevent those serious consequences of the malady.

44. E. *Pellicular vulvitis* is generally most successfully treated by applying to the affected surfaces powdered alum, or calomel, or borax, with mucilage or honey, or strong solutions of the nitrate of silver, or of the chlorides, &c. Having arrested this form of the disease by these means, emollient or detersive lotions, hip-baths, and the remedies advised for the milder varieties of vulvitis may then be prescribed (§§ 40, 41.). The constitutional treatment should depend upon the peculiarities and circumstances of the case. But generally this form of the disease is not benefited, but it may be injured, by vascular depletions; whilst saline aperients, and alkaline, saline, and other depurants of the blood, conjoined with tonics, are beneficial. The treatment of this variety of the disease is in most respects the same as I have advised for *pseudo-membranous* STOMATITIS (see §§ 14, 15.).

45. F. *Phlegmonous vulvitis* (§ 30. *et seq.*) may, when left to itself, especially in cachectic habits of body, occasion serious destruction of parts, sinuses and fistulous openings and communications with adjoining organs, or prolonged ulcerations. To prevent these consequences: — 1st, The patient should be kept in bed, or on a couch, in a cool temperature, with the thighs wide apart; — 2d, A considerable number of leeches should be applied between the labium and thigh, or upon the perineum; — 3d, To cover the phlegmon, twice or thrice daily, with mercurial ointment previously to applying linseed poultices; — 4th, To direct a warm bath every second day, or a hip-bath every evening or night (VELPEAU). The abscess may spontaneously open, when thus treated, from the fifth to the eighteenth day; but it is generally more beneficial to open the abscess as soon as matter is formed, than to wait for a spontaneous discharge, which may take place in an undesirable situation, or after the abscess has occasioned more or less serious alterations, such results being not uncommon in unhealthy constitutions. The question as to the situation in which artificial opening of abscess of the vulva should be made, has been decided by M. VELPEAU in favour of the external surface of the affected labium, and in the lower or posterior part of the swelling or abscess, for reasons he has assigned in the article referred to in the BIBLIOGRAPHY.

46. G. *Phagedenic ulceration of the vulva* (§ 33. *et seq.*) is the result of a molecular loss of vitality of the tissues poisoned by the contact of the irritating and contaminating fluid into which the dead molecules are resolved. It is identical in its nature with *phagedenic stomatitis*, as already stated; and the local, as well as the constitutional, treatment is in every respect the same as I have advised for that dangerous malady. (See art. STOMATITIS, §§ 31—33.)

47. H. *Gonorrhœal vulvitis* (§ 38.) is treated as follows by M. RICORD and MR. ACTON. In the commencement a soothing plan should be employed, and separation of the surfaces attempted, followed by lotions of nitrate of silver, in the proportion of ʒj to ℥ij of distilled water, and by warm baths. If the inflammation has gained the deeper tissues, the soothing plan should be adopted; or leeches should be applied to the groins. If a phlegmonous condition of parts occurs, depletions should be chiefly relied on; and the moment that an abscess is formed, an opening should be made into it, in order to prevent the pus from burrowing through the cellular tissue. When urethritis is much complained of, cubebs and the balsams, with demulcents, are then required. Afterwards, balsams and lotions of the solution of the nitrate of silver should be prescribed.

48. I. The *consequences* of the several forms of vulvitis must be treated with reference not only to their actual states, but also to the circumstances, features, and complications of individual cases. General therapeutical principles will guide the physician in respect of these as well as of other

morbid conditions, recollecting, however, as respects the most of them, that strict attention to ablutions by suitable means; to the digestive, assimilative, depurating, and excreting functions; and to the promotion of constitutional power, and of vital resistance to the extension of disease, are the surest principles of successful practice.

49. III. STRUCTURAL AND OTHER LESIONS OF THE VULVA.—These consist chiefly of *hypertrophy of the nymphæ*, of *tumours of the clitoris*, *thrombus* or effusion of blood in the labia after injuries or parturition, *fistula*, *cancer*, *herniæ*, *elephantiasis* of the vulva or of the nymphæ, *tumours* or *cysts* — erectile, sebaceous, follicular, or others — the growth of *hair within the vulva*, &c. These concern the surgeon rather than the physician, and require no remarks from me. The only exception may be made in regard of *hypertrophy of the nymphæ*, which may take place to so great an extent as to require their extirpation. In unmarried females, advanced in age, this change has undoubtedly proceeded from masturbation. But in very young females, to whom this vice could not be imputed, and also in children, the nymphæ are sometimes so greatly developed as to protrude far below the labia majora. Of this state of parts I have seen several instances. In one case which came before me, the very enlarged and prolonged nymphæ were extirpated. The hæmorrhage was very considerable, but recovery was complete. The clitoris may be enlarged as well as the nymphæ; and in such cases the enlargement is probably owing to masturbation. These parts have been observed by **LARREY**, **GILBERT**, **CLOT-BEY**, **TALRICH**, and others, to have been the seats of elephantiasis; the tumours which resulted having been as large as a child's head. M. **VELPEAU** has referred to several cases of this nature, which, however, are not rare in Egypt and other parts of Africa.

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VEINS, DISEASES OF

—1. This order of circulating vessels has not received that share of attention and research which it deserves in several states of disease, either implicating it more especially, or affecting the frame generally, and changing more or less not merely the blood circulating in it, but the whole mass of blood supplying all the organs and tissues of the body. Hence alterations of these vessels should not be viewed with reference to themselves only, and as local changes merely, but with a due recognition of the effects produced by them on the blood, and, through the blood, upon the whole frame. Even this apparently comprehensive view is not sufficient;—it is only one aspect in which this subject should be studied — one side of the object — for another presents itself to the experienced and searching eye, viz. the many noxious agents, and the numerous local changes and structural lesions affecting primarily the several tissues and organs, frequently altering either the blood in these parts, or the veins originating in them, or even both, successively contaminating the blood and circulating systems, and ultimately altering the vital cohesion and the intimate organisation of all parts of the living body.

2. It would be impossible, even were it necessary, to consider the diseases of veins, especially in connection with those of the blood, with that amplitude which I might desire, or others expect. This subject can be viewed only in its more practical and important relations, at this place. The full consideration which I have bestowed on the several matters and topics intimately connected with diseases of the blood and circulating organs and vessels, and on the treatment of them under their respective heads, in the early parts of the work, prevents me from attempting more at this place than to notice what has not already come under discussion.

3. It is chiefly to JOHN HUNTER that we are

indebted for the earliest and best information respecting diseases of the veins, and especially as to the treatment most appropriate to inflammation of them. Since his time the researches and works of BAILLIE, HODGSON, CRUVEILHIER, MECKEL, BRESCHET, DAVIS, DANCE, LEE, GENDRIN, RIBES, ARNOTT, and others, have tended most essentially to advance our knowledge of these important subjects. Diseases of the veins resemble those of the *lymphatics* and *arteries* (see those articles) in some respects, and differ from them in others, particularly as regards the constitutional symptoms. The veins never exhibit an alteration in all respects similar to aneurism, because their coats yield equally to pressure, and are not subject to the forcible impetus of the blood: besides, their inner coats are more susceptible of dilatation without rupture, than those of the arteries; they are, however, more subject to inflammation and varicose dilatation than the latter vessels.

4. Ossific formations, which are so often met with in arteries, are seldom found in veins. The difference of texture is not sufficient to account for this; for, as M. ANDRAL remarks, the structure of the pulmonary artery is the same as that of the aorta, and the right side of the heart is organised precisely as the left; and yet ossifications are much more frequent in the aorta and left side of the heart than in the pulmonary artery and right side. The more abundant supply of ganglial nerves to the arteries than to the veins may, perhaps, tend to create a difference as to the nature and frequency of diseases of these two orders of vessels. The constitution of the blood, and peculiarities of the circulation in each, may also contribute to diversify their maladies. The circumstance of the blood being oftener coagulated and organised in the veins than in the arteries may be chiefly imputed to this latter cause, and to the more frequent occurrence of inflammation in the former vessels. Pus is more commonly found in the veins than in the arteries; this is owing to three causes — 1st, to the greater frequency of inflammation of veins; 2d, to the circumstance of this morbid secretion being carried into the veins by absorption; and 3d, to the probable metamorphosis or alteration of the pus-globules before they reach the arterial circulation. Perhaps the second and third causes are the most influential.

5. The constitutional effects of diseases of the veins, and the consequences of inflammation of them, differ very considerably from those which characterise the maladies of the other orders of vessels composing the vascular system; but the differences are chiefly apparent in acute inflammations of these vessels, as will be observed upon referring to what has been stated respecting these diseases.

6. I. INFLAMMATION OF VEINS. — SYNON. *Phlebitis* (from φλεψ, a vein); *Aderentzündung*, *Blutaderentzündung*, Germ.; *Phlébite*, Fr.

CLASSIF. — III. CLASS, I. ORDER (*Author in Preface*).

7. DEFINIT. — *Tenderness, tension, acute pain, and a knotted, cord-like swelling or hardness in the course of a vein or veins, sometimes with discolouration, when the veins are superficial, extending both to, and from, the centre of circulation, with symptomatic fever, which often passes into an adynamic state, with indications of contamination of the blood, or purulent formations in the viscera or other parts.*

8. *The pathological anatomy* of phlebitis will be more fully shown in the sequel; but it may be stated at this place that inflammation of veins occasions — 1st, The formation of coagula adhering, by means of the lymph exuded from the inflamed surface, to the internal membrane of the vessel; — 2d, The secretion of pus, which may be surrounded by a false membrane, or by coagulated lymph, or be contained in coagula adhering to the internal surface of the vessel; — 3d, The secretion of pus, which is not surrounded either by plastic lymph, or by a coagulum, but which has a free access to the current of circulation; — and 4th, The secretion of an ichorous or sanious fluid from the inflamed inner membrane, which rapidly mingles with, and contaminates, the blood, and generally produces rapid and fatal changes of the structures. Instead, therefore, of viewing phlebitis, as heretofore, to consist of only *two* principal forms, viz. the *adhesive* and the *suppurative*, the latter being either confined or free, I would add a *third*, the *ichorous* or *poisonous*.

9. *Inflammation of veins* is of the greatest importance as respects both the local lesions and the consequent contamination of the blood. It is much more frequently seen than inflammation of arteries. Its seat is the cellular tissue of the vein, and the circular fibrous coat, in as far as the latter exhibits any degree of redness or vascularity; and its products are deposited in both these, and in the non-vascular or internal lining membrane extending into the canal of the vessel. It more frequently is *acute* than *chronic*, the former being distinguished by an exudation on the inner surface of the vessel. When phlebitis — inflammation of the coats of the vessel — is the primary disease, the changes of the blood, and other alterations within the inflamed vein, are consequences of this inflammation, these changes being secondary. But, when the blood in a vein is coagulated, or is otherwise remarkably altered or poisoned, it may, in such a state, irritate the internal membrane of the vein, inflame it, or all the coats of the vessel, the phlebitis being thus consecutive or secondary. The disease may be seated in a single vein, or extended to several, or even to many, whether it be thus primary or consecutive.

10. JOHN HUNTER first demonstrated the pathological changes and the consecutive phenomena of phlebitis. Many years afterwards, SASSE, B. TRAVERS, ABERNETHY, HODGSON, and BRESCHET, directed their attention to this disease; and more recently RIBES, ARNOTT, DANCE, DAVIS, R. LEE, MARÉSCHAL, BOUILLAUD, CRUVEILHIER, VELPEAU, BLANDIN, ROKITANSKY, and others, have contributed facts and opinions respecting it. Nevertheless the subject is by no means exhausted; for there still remain various topics connected with it, both pathologically and therapeutically, requiring further elucidation and confirmation.

11. i. THE CAUSES OF PHLEBITIS. — Inflammations of the veins are much more frequent in the male than in the female sex, if phlebitis consequent upon parturition be excluded from the account, and in ages from fifteen years to fifty. This greater frequency in males, and in the active periods of life, is probably owing to a greater ex-

posure to injuries and other exciting causes in this sex and age. These causes are numerous, but they chiefly consist of external injuries of various kinds, more especially punctures, lacerations, abrasions, fractures, and contusions; punctures or divisions of veins, particularly with blunt, ragged, foul or poisoned instruments; wounds, punctures or injuries in anatomical dissections or during post-mortem inspections; cuts or scratches when preparing or dressing animal food, especially game, &c.; operations, &c., when performed in foul wards of hospitals, or in low, impure, and ill-ventilated localities or apartments; fractures, compound or comminuted, in similar circumstances; ligatures or surgical operations on veins; the application of caustics or local irritants; the existence of ulcerated or tubercular cavities, or of abscesses or malignant formations, with which veins communicate, or into which either of these morbid matters pass; and the imbibition of morbid matters by veins or sinuses, from cavities in which morbid secretions, fluids, or deposits accumulate, as the cavities of the uterus and cervix uteri, or from ulcerated cavities in the lungs, liver, &c., or from necrosed bones, or sphacelated structures, or from purulent matter lodged under the flaps formed in amputations. These last, venesections, and punctured or other wounds, are the most common exciting causes of phlebitis.

12. In hospitals, especially during the prevalence of hospital gangrene or erysipelas, either within them or in their vicinity; in camps or barracks, prisons or crowded vessels, especially transports; and in low, damp, crowded, and imperfectly ventilated situations, and in localities exposed to noxious exhalations, particularly in malarious states of the air, or when erysipelas is prevalent in them, and when the more common exciting causes are of frequent occurrence, phlebitis may then assume an endemic or epidemic prevalence. In these circumstances and seasons, venesection and other operations involving veins, can seldom be performed without the risk of producing the asthenic, or most dangerous form of phlebitis (§ 21. *et seq.*); and indeed these operations, especially venesection, should be on such occasions avoided as much as possible.

13. Phlebitis is sometimes not only *caused* by, but often also *associated* with, organic lesions of internal organs, especially with ulcerations of the intestines, with abscesses in the liver, kidneys, lungs, brain, ears, &c.; and is occasionally detected in the mesenteric, the portal, and the pulmonary veins, and even in the veins and sinuses within the cranium, upon dissection. It is, however, most frequently associated with uterine diseases, and with inflammations and abscesses of the uterine ligaments; the iliac, spermatic, and other veins, having become consecutively inflamed, as stated in the articles on diseases of the PUERPERAL STATES, and of the UTERUS.

14. ii. SYMPTOMS.—*A.* The *symptoms of sthenic phlebitis* may be divided into *two stages*, namely,—1st, Those which are local, and characterise the local limitation of the malady;—2d, Those which indicate the contamination of the blood, and general infection of the frame.—1st. *The local signs* are generally very manifest when any of the more superficial veins are attacked; but they are very equivocal when the deep-seated and internal veins are implicated. Phlebitis usually commences with sharp or severe, sometimes violent, pain in a part, or in the course, of a vein. If the vessel be superficial, it will be found hard, tense, as if stretched, forming under the skin a cylindrical or knotted cord. At the same time the skin sometimes presents a reddish line or more extensive erythematous blush, or even an erysipelatous appearance. If the vessel is more deeply seated, tension and hardness may be felt in the situation or course of the pain. Congestion or engorgement of the capillaries of the cellular tissue adjoining or surrounding the inflamed vein, are afterwards observed; and if several veins, or a large trunk is affected, this tissue, and the parts below or distal to the seat of disease, become œdematous, or very remarkably swollen. With the local lesion, the constitution sympathises more or less remarkably, the general symptoms varying with the severity and extent of the inflammation, and with the temperament and habit of body of the patient; but quickness of pulse, heat of skin, headache, loss of appetite, thirst, and impaired secretion and excretion, with other symptoms of inflammatory fever, are commonly observed.

15. In favourable states of the constitution, and when judiciously and early treated, the disease may not proceed further. The coagulum formed in the inflamed veins adheres to the parietes of their canals; a collateral circulation is established, and the inflamed veins no longer permit the circulation of blood through them. In some cases the inflammatory exudation on the internal surface of the vessel, or the coagula formed on its sides by means of this exudation, leave a central canal, allowing a partial circulation of blood along it. In other instances the inflamed veins secrete pus, which may be so abundant as to give rise to fluctuation, or other indications of its presence in the sub-cutaneous chord, which is felt when the vein is superficial; and, if an artificial issue is not given to it, the matter makes its way into the adjoining cellular tissue, and forms an abscess, which follows the usual course. When the local lesion does not terminate in either of these ways; and when the morbid exudation, or purulent matter furnished by the inflamed vessel, is carried into the blood, the system becomes generally infected, owing to the contamination of the blood thus produced, and the second period or stage of the malady is developed—or the state of *pyæmia*.

16. 2d. This stage of phlebitis, or that of *vascular infection*, may take place rapidly, or not until after a few days, the rapidity of its occurrence depending upon the nature of the exciting cause and the constitution of the patient. It usually commences with chills or rigors, followed by hot skin, and other symptoms of fever, and by perspiration. These paroxysms of chills, fever, and sweats generally return at irregular intervals, assuming a remitting form; but in some instances they are periodic. With these exacerbations, anxiety, distress, or slight or occasional wandering delirium appear; and these are followed by more continued delirium, which is generally low or muttering, rarely lively or excited. The tongue, previously furred, now becomes dry or encrusted, is trembling, or imperfectly protruded; the teeth and lips are fuliginous; the countenance is sunk,

dusky or pale, and lurid, and the symptoms assume a typhoid or adynamic character. The pulse is small, very frequent, and soft. These phenomena are observed in nearly all the cases at this stage; and others are less constantly present, especially retchings and vomitings; diarrhœa, the stools being dark and very offensive, the urine turbid and fœtid or ammoniacal, and the surface dark or dusky, or slightly jaundiced.

17. During this stage, and often at an early period of it, secondary abscesses form in some internal organ, with indications of oppression, tenderness, or distress, referred especially to the regions in which the affected organ is seated. In some cases the larger joints become extremely painful and swollen, from the formation of pus within their capsules. Purulent deposits, without any very manifest indication of pre-existing inflammation, sometimes form not only in the internal viscera, or in the joints, but also in the intramuscular tissues, and even in the brain, occasioning profound coma. If this stage continue even for a few days, extensive bed-sores and sphacelations occur in the situations on which the weight of the body chiefly rests; and, the sensibility of the urinary bladder being in great measure lost, the urine becomes ammoniacal, or the functions of the kidneys much impaired, contamination of the circulation is further increased, and its consequences accelerated, death generally ensuing with a celerity according to the extent and rapidity of these changes.

18. The *extension* of the inflammation is generally in the direction of the heart, or of the current of circulation; but a fatal result often takes places before the inflammation reaches the vena cava, or even the larger venous trunks, owing to contamination of the blood by the exudation, or purulent matter, from the inflamed parts. In some cases, however, the disease pursues a different course, and extends to the smaller ramifications. Mr. ABERNETHY met with a case of phlebitis after bloodletting at the bend of the arm, in which the veins were affected down to the hand. This more unusual course is very probably occasioned by the complete obstruction of the part of the vein first affected by a coagulum or exudation of lymph. It may also be partly the result of the state of constitutional power. It is not infrequent in puerperal phlebitis, the cause of which is chiefly the imbibition of sanious matters from the internal surface of the uterus, aided by shock and vital depression, and by the predisposition produced by an impure air.

19. iii. OF THE DIFFERENT PATHOLOGICAL CONDITIONS OBSERVED IN PHLEBITIS.—The several pathological states constituting the different *varieties* of inflammation of veins have not been sufficiently investigated and demonstrated by pathologists; and most writers have described two varieties only, namely, 1st, the *adhesive* or common, —and 2d, the *suppurative;* and, whilst they have viewed the former as merely a local disease, they have considered the latter as productive of vascular *contamination* and general *infection.*—*a.* Of these varieties it may, however, be remarked, that, although the *adhesive* is characterised chiefly by an exudation of lymph more or less adhesive and concrete, on the internal surface of the inflamed vein, and often no further affecting the blood than causing the formation of a clot within or near the inflamed part, yet it is attended by more or less sympathetic febrile disturbance; and that the coagulum thus formed may be productive of much consecutive disease of the vein, if the local and constitutional treatment be not judiciously managed. Even after the exudation of lymph, or the formation of a coagulum, by means of which the extension of the inflammation and contamination of the blood are prevented, if constitutional power and vital resistance be much reduced, the coagulum thus formed may irritate the internal surface of the vessel, and either perpetuate or rekindle the inflammatory action.

20. *b.* The *suppurative* variety of phlebitis is generally productive of contamination of the blood and of most dangerous constitutional disease. Nevertheless instances are occasionally observed, in which the purulent matter at first formed, mingling with the blood in the vessel, causes its coagulation, and the coagulum thus formed arrests the circulation and the extension of the inflammation in the direction of the heart, and either allows the morbid action to subside, or favours the extension of it to the more external coats of the vessel and to the surrounding cellular tissue, occasioning abscesses in the course of the inflamed vein, and prolonging the disease. In these cases little or no contamination of the general mass of blood takes place, unless the constitutional powers and vital resistance to the extension of the local disease be much impaired, either by the continuance and amount of the local lesion, or by an injudicious or a too lowering treatment.

21. *c. Asthenic,* or *diffusive,* or *poisoned phlebitis,* has not hitherto been described as a very important variety, although it is the most dangerous of any form which the disease assumes. It occurs in all the circumstances, and arises from all the causes, which occasion the other forms of phlebitis. But it more especially proceeds from causes superadded to these, more especially from those which depress the vital energies, and infect the system. It is generally the result of two classes of causes,—1st, those which depress the constitutional powers, and produce more or less of general cachexia before the vein is injured or wounded,—and 2d, those which lower or exhaust the energy of the body, and either prevent the depuration, or favour the contamination of the blood during or after the infliction of the injury or the other exciting causes of the phlebitis. The *first* class comprises malaria of all kinds; the foul air of crowded wards; or that produced from the discharges or exuviæ of the sick or of others; improper or insufficient food, &c.; the *second* includes those already mentioned, when they come into operation during and after the infliction of the injury, or subsequently to the other exciting causes of the disease, violent shocks to the vitality of the frame, poisoned wounds, abrasions, &c., infectious emanations from erysipelatous or gangrenous sores, or morbid discharges; the absorption of purulent, putrid, sanious, or diseased matters from sphacelated, necrosed, or otherwise altered structures, or of decomposed blood, or vitiated secretions and excretions.

22. (*a*) This variety of phlebitis is characterised by the rapidity, severity, and the fatal tendency of the local and constitutional symptoms, and the marked depression of vital power, and the con-

tamination of the circulating fluids, by which they are attended. Organic nervous energy is remarkably impaired, and all the manifestations of life more or less lowered. The functions of the brain are early disturbed, and the pulse becomes rapid, soft, open, and compressible; the surface of the body soon losing its vital appearance, and becoming livid, dusky, and sallow, sometimes dry and harsh, and ultimately clammy and cold. Delirium occurs early, and passes into stupor or coma. Locally, œdema, cellular infiltration, great tenderness on pressure, boggy swellings, and diminished temperature of the affected limb, are often remarked; and if the injured or affected vein be exposed, as when the disease follows venesection in the circumstances just alluded to, the wound is gaping, union of the divided tissues not having taken place, and an ichorous or a sanious fluid exudes from the part, or slight hæmorrhage occurs on examination. In addition to the above more constant phenomena, others are observed, arising out of the varying combination of the predisposing and exciting causes, and the state of the patient. These are chiefly a tympanitic state of the abdomen, retchings or vomitings, diarrhœa, the evacuations being offensive and unnatural; the rapid occurrence of bed-sores; offensive or ammoniacal states of the urine, severe pains and swellings in the joints or extremities; congestions or puriform infiltrations of internal viscera, with tenderness and opression referred to the regions corresponding with the affected organ, &c.

23. When *uterine phlebitis* takes place, it may assume either of the forms above described, and owing to such forms, and to the circumstances in which they severally appear, the different varieties of puerperal fever are developed; the more malignant kinds of these fevers being the results of the ichorous and sanious fluids imbibed from the interior of the uterus by the uterine sinuses and veins, or of the morbid exudation from the asthenically inflamed veins of the uterus and its appendages, and of the consequent contamination of the blood, aided by the vital shock of parturition, and by the foul or infectious air in crowded or ill-ventilated lying-in hospitals or wards. (See Art. PUERPERAL DISEASES.)

24. iv. The *appearances* observed in dissection of fatal cases of phlebitis, as respects the *veins*, are described in the sequel (§ 57. *et seq.*); those which regard the frame generally, are fully given under the head PUERPERAL DISEASES (§ 221. *et seq.*), and are nearly the same as those observed after *putro adynamic* FEVER (§ 513. *et seq.*); and those which are found when phlebitis occasions *consecutive* and *diffusive abscess*, are described in the article ABSCESS (§ 27. *et seq.*) *

25. v. The DURATION of phlebitis is very variable. It is often very short in the asthenic and puerperal states, and may, when accelerated or exacerbated by the foul air in lying-in wards, not exceed 48 hours, although more frequently it continues several days, or even longer. Phlebitis consequent upon venesection is rarely of less duration than three or four days. The suppurative form of the disease generally continues from ten to twenty-one days, and the adhesive form much longer, or several weeks; but the duration of each of the varieties of the disease varies much according to the causes, the treatment, and the constitution of the patient.

26. vi. SEATS OF PHLEBITIS. — Inflammation may attack several veins, or only one vein, or small part of a vein. It generally extends to the whole circumference of a vein, and is very rarely limited to one side of the vessel. The veins most frequently inflamed are those of the extremities, after wounds and injuries; next, those of the uterine organs and appendages, especially in the puerperal states, and the pulmonary veins. The veins least frequently affected are the ramifications of the portal and hepatic veins; the sinuses and veins of the dura mater; the vena cava, and the veins of the spine, and of the spongy structure of bones. Phlebitis of the umbilical chord, or inflammation of the umbilical vein in new-born infants, is not a rare occurrence. Several recent pathologists, more especially MM. RIBES and CRUVEILHIER, have supposed that the venous capillaries may be the seats of inflammation, and have ascribed erysipelas to phlebitis of the most minute of these vessels.

27. (*a*) *Inflammation of the veins of the arm* is most frequently consequent upon venesection, and especially when this operation is repeated. It may, however, occur after amputations, fractures, punctured or other wounds, &c. It commences with pain in or near the seat of incision or puncture, extending upwards. If adhesion has not taken place, the margins separate, swell, suppurate, and the pus formed in the vein escapes externally, especially if pressure be made on the vein from above downwards. If the incision through the integuments has closed, the margins swell, and the cicatrix opens. The inflammation may extend from the seat of injury to the axilla, to the jugular, to the superior cava, or even to the right auricle. In this case death generally soon ensues, although instances of recovery have

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* In the following case, by M. LE HERISSÉ, as quoted by MR. ARNOTT, some of the most remarkable secondary effects of phlebitis are described. "Gasper Goldinger, subject for the last six weeks to epilepsy, was bled twice from the arm on the 1st of November, 1806; on the 8th, from the foot; and on the 10th and 13th, from the jugular vein. On the 16th, he was again bled from the arm (the right), which on the following day felt painful; some redness and tension were observed round the aperture; 15th, arm very painful and swollen from the shoulder to below the elbow; edges of the puncture, red; face and skin of the body of a yellowish colour, pulse feeble and frequent; 19th and 20th, fever more intense; tongue, dry and coated; great pain in the arm; 21st and 22d, lies supine; prostration of strength; heat of skin; tongue, dry; pain in the right side of the chest; respiration, short; 23d, tension of the arm diminished' some pus flowed from the wound made in bleeding; respiration short. Died at night, seven days after the receipt of the wound in the vein.

"*Dissection.* — The wound in the cephalic, open; the vein filled with pus through the whole length, *i. e.* from where it terminates in the axillary to the bend of the elbow, where it divides into the medial cephalic and superficial radial; the latter of which cotnained pus for two inches below its origin. The coats of the vein were much thickened, indurated, and red. In the interfibrilear cellular tissue of the pectoral muscle of the right side was a quantity of thick greenish pus. Eight or ten ounces of yellowish opaque serosity were contained in the right sac of the pleura. The lung of this side was unadherent, that of the left was adherent over its whole surface by a delicate false membrane. Both lungs presented a number of hepatised portions, varying in size from that of a nut to that of a large walnut, gorged with fluid, which in some of them was puriform. The arachnoid membrane was opaque, thickened, and indurated, effusion of fluid between it and the pia mater, and into the texture of the latter. Some yellowish serum in the ventricles."

been recorded. The disease may also extend along the veins below the seat of injury, especially when the circulation in the vein is obstructed by lymph, coagula, &c. Phlebitis in this situation may present either of the forms described above.

28. (*b*) *The veins of the lower extremities, and the iliac veins*, or either separately, may be inflamed; the former from the same causes as occasion phlebitis in the arm, the latter most frequently as a consequence of the puerperal state, or of the cancer of the uterus, and of tubercular disease. Inflammation of the iliac veins is most frequently manifested in the form of *phlegmasia alba dolens* (*see this Art.*), although phlebitis is not the only pathological lesion of this disease. M. Toulmouche contends that the much more frequent occurrence of the malady in the left thigh than in the right, is owing to the accumulation of fæces in the sigmoid flexure of the colon, and to the consequent pressure made on the iliac vein, to the retardation of the circulation through it, and to coagulation of blood in it. (*Gaz. Méd.* Avril, 1844.)

29. (*c*) *Inflammation of the vena porta* has been observed by MM. Ribes, Bouillaud, Dance, and Frey, and they, as well as others, have ascribed redness of the internal surface of the ramifications of the vena porta, and of the hepatic veins, to inflammation; but it is not improbable that this appearance is more frequently owing to cadaveric imbibition of the colouring matter of the blood. True inflammation of the vena porta is a very rare occurrence; it is attended by a sense of weight and of pain in the right hypochondrium, greatly increased on pressure; by regular or irregular rigors; by extension of pain to the right shoulder; by jaundice, more or less developed; by nausea, vomitings, and sometimes singultus; by diarrhœa, more or less bilious, and ultimately by the usual indications of purulent infection of the blood. These symptoms are, however, in most respects, the same as those accompanying acute abscess of the liver.

30. (*d*) *The sinuses of the dura mater* are not infrequently inflamed, consecutively on injuries to the cranium, membranes and substance of the brain, on inflammation of these parts, on inflammation of the ear, on caries of the temporal or other bones of the cranium. They may also become inflamed in the advanced course of erysipelas of the scalp, and of other maladies and lesions, as I have fully described many years since. (See Art. Brain, Sect., *Inflammation of Sinuses of the Dura Mater, and of the Vessels of the Brain*, § 37. *et seq.*, vol. i. p. 208, 9.)

31. (*e*) *The umbilical vein* has been found inflamed in recently born children, by MM. Sasse, Breschet, Duplay, Trousseau, and others; and has been referred to ligature of the chord. It has been observed associated with erysipelas, with peritonitis, and with enteritis. The *veins of bones* have also been noticed by M. Gerdy. *Uterine phlebitis* has been considered in the Article on Puerperal Diseases. (See §§ 189—197.)

32. (*f*) *Inflammation of the vena cava* is met with only consecutively upon inflammation of the uterine iliac or other veins. M, Bérard has found inflammation of the vena cava extending as high as the confluence of the venal veins in cases of *phlegmasia dolens*: cases of inflammation of the cava have been observed and described by Travers, Hodgson, Dance, and others. The symptoms indicating extension of inflammation and of its consequences to this vessel are rather inferential than positive. These consequences are the exudation of lymph, the formation of pus, or of coagula, or of all these, and more or less obstruction of the circulation along the vena cava. If there be observed, consecutively upon phlebitis of either lower extremity, acute or rapidly developed œdema, or dropsy of both the extremities, especially during the puerperal state, or at an advanced stage of fever, or at an early period after the subsidence of fever; and if, after the occurrence of œdema of both extremities, indications of the development, in the surface of the trunk, of a supplemental venous circulation, it may be inferred with much probability that inflammation and its consequences have extended to the vena cava.

33. *Obliteration* has been observed by Haller, Wilson, Baillie, Cline, Reynaud, the writers already named, and by others, to follow inflammation and obstruction of the vena cava. The cases which have been recorded of this remarkable lesion have presented extensive anastomoses, not only between deep-seated veins, but also between the principal superficial veins of the trunk, these latter appearing uncommonly enlarged, and anastomosing with each other. This very great development and free anastomoses of the superficial veins of the trunk have followed gradually upon the dropsical or œdematous state of both extremities; but, in some cases, especially those under consideration, and of most marked enlargement and anastomoses of the superficial veins, the œdematous state of the lower extremities gradually diminishes. The particular veins by which the supplemental circulation is carried on are in some respects different in different cases, according to the seat of obstruction or obliteration of the cava, and to the trunks of veins, from which the inflammation extended.

34. vii. The Diagnosis. — Phlebitis may be mistaken, at an early period of its course, for lymphangitis, or the latter may be mistaken for the former. But the large cylindrical chords, wreathing in diverse forms, appearing when the superficial veins are inflamed, and the œdema of the distal or more remote parts, cannot be readily mistaken for the reddish, painful, small, straight, and knotted lines passing in the direction of, and enlarging, the lymphatic glands, above the seat of the complaint. In neuritis and neuralgia the pain is more acute or pungent than in phlebitis, and the appearances observed in phlebitis are not present, especially the œdema of the parts below the seat of pain, &c. When the consecutive or contaminating effects of phlebitis supervene, the low fever, the dusky, sallow, and discoloured skin, the diarrhœa, the rapid weak pulse, delirium, &c., although assuming the form of adynamic fever, may be distinguished from this latter by the antecedent local symptoms, by the causes, and by the whole history of the case.

35. viii. The Prognosis.—The danger of phlebitis is always considerable, because, although it is by no means imminent as long as the disease is merely local, yet infection and contamination of the blood, on which great danger depends, may unexpectedly and suddenly supervene. The symptoms

described above (§ 16. *et seq.*), as indicating this contamination of the blood, and more especially those which attend consecutive or diffuse abscess in the lungs, liver, or other organs, are always those of extreme danger. Cases presenting signs of internal consecutive abscess are irremediable.

36. ix. PATHOLOGICAL INFERENCES. (*a*) — The liability to phlebitis as a consequence of the operation of any of the exciting causes, or even without any other cause than that which favours this liability, is great in proportion to the amount of hæmorrhage, or of vascular depletion, which has been the result of the injury or incision of a vein. — (*b*) Persons addicted to the abuse of intoxicating liquors, or of tobacco, are more liable to this malady than others; and the liability extends to those who are weakened or anæmied by pre-existing disease, or who are of an unhealthy or cachectic habit of body. — (*c*) In the circumstances now stated, and in convalescents from, and even in the advanced stages of, exanthematous and adynamic fevers; in the course of acute rheumatism, of pulmonary consumption, and of diseases of the womb and its appendages, blood may coagulate in some situations in the veins, owing either to its remora, or to its altered state, or to defective vital power in such situations, and may inflame the inner coats of the vein in which it coagulates. — (*d*) The passage, or imbibition of purulent, ichorous, sanious, putrid, or tubercular matter into a vein or venous capillary may either coagulate the blood as it circulates onwards in a venous trunk, and in consequence of this coagulation inflame the vein; or the morbid matter may irritate, inflame, or poison the internal surface of the vein, the inflammatory exudation from the inner coats of the vein coagulating the blood in it, or, failing in this, contaminating the blood circulating through it. It must be difficult to determine the exact sequence of results, and probably either or all may supervene. — (*e*) The morbid alterations in the veins may extend far along the veins from the seat of injury, as that produced by blood-letting, or even to the vena cava, or to the heart itself; and they may proceed also in an opposite direction, or beyond the injured part, although rarely to any considerable distance; the fatal issue, however, is not owing to this extension, although aided by it, but is chiefly the result of the contamination of the blood, and of the effects produced by this contamination on the organs and tissues of the frame. — (*f*) Consecutive diffuse abscess in the viscera, suppuration of joints, &c., are not occasioned by the transmission and deposition of purulent or other morbid matters from inflamed veins, or absorbed from primary seats of suppuration, caries, or other disease, but are the consequences of acute asthenic inflammations of these viscera or joints caused by the thus poisoned or contaminated blood. — (*g*) The sequence of morbid phenomena, or the succession of alterations from the commencement of irritation and inflammation in the vein, until the disorganisation consequent upon the diffusive suppurations ultimately produced in the viscera or joints, is accelerated by means which lower vital power and diminish the amount of blood circulating in the body.[*]

37. II. TREATMENT OF PHLEBITIS. — The concluding one of the above inferences will indicate the principles which, in my opinion, should guide our practice in phlebitis. The following circumstance may have had some influence in directing my attention and influencing my views regarding this important subject. When in London for a short time, in August 1815, I had occasion to converse with a well known public man of that time, who informed me that he had been, about thirty-five years previously, a patient of JOHN HUNTER, he having suffered an attack of inflammation of the veins after venesection, which had been twice repeated, to a large amount, for pneumonia; and that the inflammation supervened on the last blood-letting. But it was not only the occurrence of the phlebitis after the last depletion which made the impression on my mind, but chiefly the treatment which he informed me had been prescribed by JOHN HUNTER in his case. This consisted, as he stated, of preparations of bark conjoined with other medicines, and of a very liberal allowance of port wine — upwards of a bottle daily — until he recovered. This treatment was altogether so different from what was generally taught in lectures and surgical works, that I continued to reflect upon it, and to contrast it with the means of cure, which I afterwards saw adopted on the Continent and in this country, for this disease, and which are still recommended in surgical and medical works. When it is considered that a very large proportion of the diseases of the puerperal state, and most of the fatal cases of amputation, proceed from inflammation of veins, and from the imbibition of purulent or sanious matters by the veins into the blood, inflaming the veins and contaminating the circulating fluids, or in other words, producing effects to which the term *pyæmia* has recently been applied, but with little regard to pathological accuracy, the importance of determining the true intentions and principles of cure for this malady must be apparent. Upon what rational grounds can we advise, as very generally advised, large local and general depletions, and a strictly antiphlogistic regimen for a disease which is frequently a consequence of such depletions and regimen?[*] Upon what therapeutical principles can means be recommended for the prevention or cure of phlebitis that tend to promote the imbibition, or absorption, and the circulation of morbid or poisonous fluids in the blood, to prevent the formation of a healthy lymph whereby the extension of the disease may be arrested, and to prostrate the vital resistance opposed by the constitution to the contamination, not only of the blood, but also of the soft solids? — and to the production of all these effects the means usually advised for phlebitis

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[*] The above inferences formed the conclusion of a paper read before the Medical Society of London, in 1823, and were arrived at after an observation of many cases of phlebitis in France and Germany during 1815 and 1816, and during 1819 and 1820; and, after duly considering the treatment which was there generally adopted. These inferences, as well as the treatment which I have recommended in consonance with them, have always been given in my lectures on Practical Medicine, from 1824 until 1842, when I ceased to lecture.

[*] "Les premiers accidents inflammatoires que l'on observe sur le trajet d'une veine seront immédiatement combattus par les antiphlogistiques les plus ènergetiques: Saignées; applications de sangsues en grand nombre, et plus ou moins répétées, suivant la force des sujets, fomentations émollientes, tels sont les moyens qu'il convient de mettre d'abord en usage." (Art. VEINE, Inflammation, in *Dict. de Méd.*, 2d ed.)

most certainly tend. With what rational intention are means prescribed to arrest the extension of inflammation of the veins and the contamination of the blood that actually and incontrovertibly favour both these results, and that have a more certain tendency to accelerate, if not to cause, a fatal issue than the natural course of the disease itself? The operation of the means of cure in this disease require to be studied and ascertained with as great care as should be devoted to the pathological changes and the consecutive alterations which constitute the nature, and occasion the imminent danger of the malady. An empirical treatment of phlebitis more frequently increases than diminishes the danger; and such empiricism, whether in phlebitis or in any other disease, being the result of ignorance, increases the number of fatal cases, and generates and perpetuates in the mind of the practitioner who is thus imperfectly informed, a scepticism in which he takes refuge, and under which he attempts to conceal his ignorance and to debase his vocation. The sceptic in medicine is ignorant not only of the nature and procession of morbid phenomena, but also of the operation of remedial agents. He is incapable of forming rational views, and is quite impotent as to their accomplishment. He therefore decries what he feels himself incapable of performing, and instead of relinquishing his efforts, he endeavours to impute his failures to the imperfections, if not to the total inefficacy, of the science; and by continuing his practice, and by thereby perpetuating his wants of success, he persists in furnishing evidence, not only of his own incompetency, but also of the insincerity of his professions; he at once admits that he practises a lie; that he professes to perform what he has no hopes of performing; that he may delude, but that he cannot cure. But, leaving the medical sceptic to luxuriate in his practice and in his belief, and advising him to reconcile the former with the latter, if this be possible in any other way than by relinquishing the one in favour of the other, I proceed to consider those indications and means of treating phlebitis, which extensive opportunities of observation disclosed; opportunities, however, in which I was then an observer only, not an actor, and which furnished more numerous proofs of a practice which ought to have been carefully avoided, than evidence of any resulting benefit.

38. i. A View of the Treatment which has been advised for phlebitis may, not without some advantages, precede the consideration of the means which I have long believed to be the most appropriate to this malady. Former writers have generally advised very opposite means for the different stages of the disease, for the local affection, and for the general infection of the frame consequent upon it. Thus we find in one of the ablest treatises on diseases of veins (in *Dict. de Méd.*, 2d ed.) which have recently appeared, it is recommended to have recourse to general blood-letting, to the application of leeches in great numbers, and more or less frequently repeated according to the strength of the patient; to emollient fomentations; to refrigerants; to the application of ice, or to cold effusion to the seat of inflammation, in the first or local period of the disease; and, in order to second the effects of this rigidly antiphlogistic treatment, the application of large quantities of mercurial ointment so as to rapidly affect the salivary glands.

39. M. Pasquier and others have had recourse to the application of narcotics locally, in the form of the decoction of poppy-heads, containing the watery extract of opium, or to similar applications, placed along the course of the inflamed veins, and frequently renewed, so as to be always wet. M. Bonnet, of Lyons, has had recourse to a very opposite treatment; viz., to the application of the actual cautery to the part where the vein is wounded, in order to prevent the absorption of pus from the inflamed vein. But the cases which he has adduced in support of his practice are too few and inconclusive to found upon them so novel a plan of cure.

40. The local treatment advised by John Hunter, and advocated by Abernethy, Reil, Velpeau, and others, had for its object to prevent the extension of the inflammation towards the heart, by enabling the constitution to throw out coagulable lymph at the inflamed part, by means of which the blood might be coagulated, or the vein obstructed. Compression of the vein above the seat of inflammation was likewise advised with this intention. These measures often were successful, but they often also failed. The remedies prescribed, however, with this view, were not always appropriate to the period of the disease, or to the constitution and habit of body of the patient, and were often resorted to at a too advanced stage, when the blood had already become contaminated, and when means calculated to neutralise or to counteract the contamination, and to depurate the blood, were required. M. Breschet attacked this very rational indication, or method, of arresting the extension of the inflammation, by contending that it was most difficult to obtain an adhesive form of phlebitis by medical treatment. But the supporters of John Hunter's doctrine had more extended views than the mere development of the adhesive form of the disease by enabling the constitution to throw out coagulable lymph. They knew, or at least hoped, that the lymph effused would favour the coagulation of blood in the inflamed veins, whereby the circulation in these veins would be entirely obstructed, and the extension of the inflammation, as well as the contamination of the blood, would be either delayed or prevented, as they also knew that the best means of limiting inflammation in any surface, more especially in that of circulating vessels, were those which supported or developed constitutional power and vital resistance to the impression of injurious agents.

41. If the views as to the treatment of the local stage or changes in phlebitis were thus diverse, those proposed for the second stage, or that of vascular infection and contamination, were no less so. The young pathologists of Paris in this matter displayed their accustomed ingenuity; but beyond this quality no further praise can be awarded them. Some, relying upon the experiments of MM. Leuret and Hamont, who stated that the injurious effects of pus injected into the veins of animals were delayed or prevented by repeated blood-lettings, proposed this mode of evacuating the morbid matters contaminating the blood; but they failed in showing how these matters could be removed with the blood which was taken away, without leaving the same

proportion in the blood which was left in the body. The fate of those who were thus treated may be readily predicated. Then was proposed the opposite system; namely, to engorge the patient with diluents, by means of which the poisonous materials may be diluted, their action rendered less injurious, and their elimination promoted by means of the skin and kidneys. M. PIORRY, the apostle of this doctrine, in his mémoire on "pyohémie," or pyæmia, adduced some evidence in its support. The due promotion of all the depurating functions, not only those now named, but also those of the intestines and liver, by suitable means, and by appropriate combinations, are important remedies for the second stage of this malady, but in most cases more even than these are required.

42. Some writers have supposed that the morbid materials which have passed into the blood may be neutralised by disinfectant or similar agents, such as the chlorides; and in certain forms they may be of service, and may with some reason be resorted to. But upon what rational grounds can repeated emetics, or antimonials, or mercurials be advised, unless upon the pure empiricism which is based on imputed, but very doubtful success? Other writers have dreaded the prostration of vital power, and its consequences, in the second stage of phlebitis, and have had recourse to tonics, especially to the preparations of cinchona, to wine, and various restoratives. The propriety of the practice cannot be doubted, especially if adopted at a sufficiently early period, and if conjoined with means appropriate to existing pathological states and to the circumstances of individual cases.

43. ii. TREATMENT ADVISED BY THE AUTHOR.— A question, preliminary to entertaining the subject of treating phlebitis, suggests itself, namely, *Is there any plan by which the disease may be prevented?* Phlebitis is most frequently a consequence of amputations and similar operations, and of operations on the veins themselves. Of these latter venesection is the most common efficient cause. From long and diversified observation I am convinced that, when phlebitis follows venesection, this operation ought not have been performed, the states of the constitution and of the circulation actually not requiring it; and that this has more especially been the case when it has been repeated more than once, or when the vascular depletion has been carried too far. Most of the fatal cases of amputation result from phlebitis and its consequences. Now, what are the circumstances which favour the occurrence of phlebitis after amputations? These are chiefly, 1st, The shock given to the constitution by the operation; 2d, The anæmied state of the system, and the exhaustion of vital power in many cases at the time when the operation is performed; 3d, The collection of purulent matter under the flaps, and bathing the surface of the stump, and the mouths of divided veins; 4th, The state of the atmosphere in hospitals, wards, and places in which the operation is performed and the patient is confined; 5th, The treatment immediately after the operation; and 6th, The means used to produce insensibility. Each of these requires a few remarks.

44. (*a*) The shock produced by the operation, especially when great or prolonged, is not only the result of reduced vital power, but also the cause of coagulation of blood in the veins and of the injurious action of the coagulated blood on the coats of the vein (see Art. SHOCK). Hence the more severe and prolonged the shock the more likely are these effects to be produced.

45. (*b*) Many cases require amputation, under unfavourable circumstances, and in others it is so long delayed, owing to the fears of the patient, until these circumstances are developed. When the constitutional power and vital resistance of the patient to disease are reduced, and the blood altered by impaired depuration and imperfect sanguification — when organic nervous energy is depressed, and the blood diminished in quantity, in crasis, or in red globules, or impaired in quality — then a predisposition to phlebitis, when the veins are implicated in surgical operations, is thereby produced.

46. (*c*) The collection of purulent matter under the flaps, often favoured by the union of the integuments, acts most injuriously upon the internal coats of the veins; and it may even be partially absorbed by the mouths of the veins in the surface of the stump, thereby producing pyæmia and its usual results. These effects are the more likely to occur in cases where vital power is greatly reduced, or where the quantity of the blood is much diminished, and the quality much impaired; and where the patient breathes a close or contaminated atmosphere.

47. (*d*) The injurious influence of a foul air in cases where veins are implicated in surgical operations is sufficiently manifest; and the frequency of phlebitis and pyæmia in hospitals, both civil and military, from this cause, is often greater than is supposed. I witnessed this influence and its effects in numerous instances soon after the Peace of 1815, both in France and Germany; and, in many more, neither the cause nor the effect was recognised. The treatment also in these circumstances, and immediately after operations implicating veins, was often injurious and calculated to occasion the mischief which it was intended to prevent. At the period now alluded to, notwithstanding the writings of JOHN HUNTER, phlebitis and its consequences were but imperfectly understood. It was not until a few more years had elapsed that the pathology of the disease was fully investigated, and up to a very recent period, and even to the present time, neither the prevention nor the treatment of phlebitis has been satisfactorily illustrated. It has been a much too general practice to have recourse to a too strictly antiphlogistic treatment and regimen after amputations, thereby aiding other causes in producing phlebitis and pyæmia. The extent to which such treatment, however, should be carried, or how far its opposite should be adopted, as well as the means by which constitutional power may be promoted, and vital resistance to the invasion and extension of phlebitis be upheld, must depend upon the circumstances of individual cases and the acumen and experience of the physician.

48. (*e*) The means used to produce anæsthesia during surgical operations, not improbably may favour the occurrence of phlebitis and pyæmia. This topic requires careful examination. A recourse to those means has its advantages and disadvantages. The former are, the greater readiness of the patient to submit to an operation at a time when it is most likely to be successful, and the

feeling in the mind of the surgeon that he is not inflicting suffering. The latter are, the depressing influence of anæsthetics on vital power, the extinction of that amount of pain in operations, which, when not too long protracted, tends to develope a salutary reaction and to favour the prevention of injurious changes after the operation; and, more especially, the alterations produced in the constitution of the blood by the passage of the anæsthetic vapour into it. These disadvantages were urged by me on several occasions immediately after the discovery of the means of producing complete anæsthesia, and subsequent observation has confirmed my opinion respecting them.

49. From the above it will be inferred, that the avoidance, as far as may be, of the several circumstances which favour the production of phlebitis, is of great importance; that all operations implicating veins should be performed in as healthy a state of the system as may be possible; that vital power and resistance should be supported and not depressed; that all contaminating influences should be avoided; that the healthy constitution of the blood ought to be studied before and after such operations, and nothing done to alter it; and that the confidence of the patient in a successful result should be upheld, and roused or increased when depressed. Conformably with these propositions, it will be manifest, that a pure, dry, and temperate atmosphere; perfect repose of a limb or a part in which a vein has been injured or wounded; protection of a wound in a vein from the access of the atmosphere; and a healthy discharge of the digestive and depurating functions, and physical and mental quietude, are amongst the most essential means of preventing phlebitis, and of counteracting or neutralising many of its causes.

50. i. Treatment of the First or Local Period of Phlebitis. — This should vary with the causes of the inflammation, with the symptoms complained of, with the habit of body of the patient, with the presumed extent to which the disease has advanced, and with the situation of the inflamed vein. The causes and seat of the inflammation equally forbid general depletion; and, unless in very plethoric or robust subjects, even local depletions are seldom required. Pain and tenderness are rarely removed by them, even in these subjects, and never in persons otherwise circumstanced. Fomentations, especially those usually applied, sometimes assuage the pain, but they favour the extension of the inflammation along the vein, and prevent or diminish the chance of procuring the occlusion of the vein by the production of coagulable lymph in the inflamed part. The *chief objects*, as to the local affection, are, to diminish inflammation and its usual products in the part; to render these products as little injurious as possible by causing occlusion of the vein, and, by these means, to prevent the contamination of the blood and the supervention of the second stage of the disease by the usual exudations which take place into an inflamed vein. The means which are most to be depended upon for the fulfilment of these intentions are generally those which also remove the more distressing local symptoms; and, whilst they thus act, they tend equally to promote the *three objects* now proposed. The local as well as the constitutional means may be varied to meet the exigencies of particular cases, and the circumstances just alluded to; but even whilst the disease is still local, internal remedies should be prescribed, as well as local applications. These latter have been, for the cases which have come under my care since the commencement of my practice, either one or other of the *liniments* prescribed in the Appendix (see Form. 295, 296, 297. 300. 307. 311.) applied in the form of an *embrocation* over the seat of the phlebitis, by means of two or three folds of flannel or of spongeo-piline; or an epithem of spirits of turpentine, or the embrocation prescribed at p. 1152. of the third volume, applied in the way now stated; the access of air to the wounded vein being assiduously prevented.

51. Whilst either of these embrocations is being applied, internal means should be prescribed with due reference to the state of vital power and vascular action, and to existing morbid sensibility and irritability. Care, however, should be had that the medicines prescribed are not such as may occasion vomiting or excessive action of the bowels, as either or both will promote the passage of the products of inflammation into the blood, or render these products more likely to pass into the circulation. The medicines prescribed internally during this period, should have for their main objects to prevent the extension of inflammation along the veins, and to assuage pain and irritability: the former of these can be attained only by developing vital power and resistance; and the means best calculated to attain this end may be conjoined with those which affect the latter object. With these intentions I have not unfrequently prescribed the following, varying the individual substances with the varying circumstances of individual cases.

No. 367. ℞ Quinæ Sulphatis; Ferri Sulphatis; Camphoræ, āā. gr. xij.: Pilulæ Galbani comp., ℈ij.; Extr. Opii, gr. vj.; (vel Extr. Hyoscyami gr. xviij.); Pulv. Capsici, gr. xij.; Bals. Peruviani, q. s. M. Contunde bene et divide massam in Pilulas xxx., quarum binæ sumantur 4tis vel 6tis horis.

No. 368. ℞ Ferri Sulphatis; Quinæ Sulphatis, āā. gr. xv.; Camphoræ, gr. xij.; Extr. Hyoscyami, ʒ ss.; Extr. Aloës purif. gr. xij.; (vel Pilulæ Aloës cum Myrrhâ, ℈j.); Pulv. Capsici, gr. xij.; Olei Cajuputi, q. s. Misce et contunde bene. Divide massam in Pilulas xxx. Capiat æger ij. 4tis vel 6tis horis.

No. 369. ℞ Liquoris Ammoniæ Acet. ℥j.; Spiritus Ætheris Nitrici, ℥ss.; Ammoniæ Sesqui-Carbon. ʒss.; (vel Spirit. Ammoniæ Aromat. ʒijss.); Tinct. Cinchonæ comp. ʒvj.; Tinct. Serpentariæ, ʒijss.; Tinct. Capsici, ʒss.; Infusi Cascarillæ (vel Decocti Cinchonæ) ad ℥viij. Misce. Cochlearia ij. vel iij. larga sumantur quartis vel sextis horis.

No. 370. ℞ Olei Terebinthinæ, ʒijss.; Spiritus Ætheris Sulphurici comp. (vel Ætheris Hydrochlorici) ʒss.; Tinct. Camphoræ comp. ℥ss.; Olei Cajuputi, ʒss.; Pulv. Tragacanth. comp. ʒiij.; Pulv. Glycyrrh. ℈ij.; Syrupi Rosæ et Syrupi Tolutani, āā. ʒij.; Infusi Cascarillæ (vel Infusi Cinchonæ) ad ℥viij. Misce.— Capiat æger Cochlearia ij. vel iij. larga 4tis vel 5tis horis.

No. 371. ℞ Potassæ Bi-Carbon. ʒij.; Ammoniæ Carbonatis, ʒss.; Tinct. Cinchonæ comp. ʒvj.; Tinct. Serpentariæ, ʒij.; Tinct. Capsici, ʒss. ad ʒj.; Infusi (vel Decocti) Cinchonæ ad ℥viij. Fiat mist. cujus cochlearia ij. vel iij. larga sumantur ter quaterve in die.

52. An apparently high or tumultuous vascular action, or an open, broad or even bounding state of the pulse, should not deter from a recourse to these or similar means; for these phenomena will much more readily subside under the influence of these, than of those of an opposite nature; for vascular action is often the greatest and the most

tumultuous, when vital power is most deficient, especially when any part of the vascular system is inflamed. By developing and increasing vital power by suitable means, in these circumstances, we more readily overcome or appease morbidly increased vascular action. Although it is not desirable to produce much action on the bowels, still the depurating functions should neither be impaired nor arrested. Hence the remedies may be combined as in No. 368., in order to prevent this result; or equal parts of castor oil and oil of turpentine may be taken on the surface of an aromatic water, or these substances, in larger quantity, may be administered in an enema.

53. During the local limitation or period of the disease the system sympathises with the local morbid action, occasioning much febrile disorder, which, although the above means may not for some time either diminish or increase, will not pass into that adynamic condition which readily supervenes upon a lowering treatment of phlebitis, owing to the effects of such treatment upon the local morbid action and to the passage of the inflammatory products into the blood. If, however, notwithstanding the means, local and constitutional, now advised, the inflammation of the vein either extends, or produces a puriform fluid, or in cachectic habits of body an ichorous or sanious exudation, which readily passes into, and commingles with, and contaminates the blood, the most strenuous efforts should be made to support vital power and resistance, to counteract or neutralise the injurious action of the contaminating materials, and to remove them from the circulation by means of the depurating organs.

54. In this, the *second or contaminating* period of the disease, the treatment will necessarily vary with the states of the several depurating functions — of those of the skin, bowels, and kidneys. The excretions from these must be frequently examined; and the means of cure prescribed appropriately to their several conditions. If the urine presents an acid reaction, the mixture No. 371. last advised may be continued, with or without the addition of the chlorate of potass or nitrate of potass or both. If the urine be neutral, or alkaline, or contain the phosphates in excess, then the nitro-muriatic acids may be given instead of these and of the alkalies contained in that prescription. If the skin be dry, or parched, or hot, the mixture No. 369. will generally increase the cutaneous functions, especially if promoted by suitable diluents (§ 56.). When it is manifest that neither the hepatic nor the intestinal functions are sufficiently discharged, then the pills already prescribed may be given; or pills containing a full dose of calomel and camphor may precede either them, or the castor oil and turpentine draught and enema above recommended (§ 52.). If the bowels become inordinately relaxed, the tonics already mentioned or others may be conjoined with astringents, small and frequent doses of creasote, absorbents and antacids, and with tincture of opium, or with compound tincture of camphor; or with any of the several remedies advised for Diarrhœa or Dysentery (*see those Articles*), according to the features of the case. It should not, however, be overlooked, that relaxation of the bowels is a mode of vascular depuration, especially when the hepatic functions are duly performed, and that this relaxation should not be arrested, unless it increase, or reduce the patient; but be moderated only, constitutional power being duly supported by the means already prescribed, aided by suitable nourishment, and by a sufficient supply of wine, at regular intervals.

55. In these and similar cases evincing not only great depression of vital power, but also more or less deficiency in the quantity and quality of the blood, the quinine, or the decoction of cinchona, chalybeate preparations, and other restoratives, may be given in increased or more frequent doses; and wherever pain, oppression, or uneasiness may be manifested, the embrocations advised above should be applied and renewed from time to time. In these and analogous states the tonics will be advantageously conjoined with camphor, ammonia, aromatics, &c., and with opium in moderate doses.

56. The *diet, regimen,* and *beverages,* prescribed for the patient ought to be restorative, and calculated to promote nervous power. Rich wines, brisk, bottled malt liquors, or bitter ales; soda-water or Seltzer-water with wine; the alcaline and chalybeate mineral waters; spruce beer and weak tar-water; Carara or lime water with warm milk, &c., are the beverages which will be found most beneficial. Free ventilation, and a warm, dry, and pure air are also most important aids of medical treatment. In most respects the treatment of the *second stage of phlebitis* is the same as that which is most efficacious for *consecutive abscesses* (see art. Abscess, §§ 62. *et seq.*), for the effects of *absorption of morbid matter* from diseased organs and structures (see Absorption, §§ 15. *et seq.*); for *inflammation of the* Lymphatics (§ 17. *et seq.*), and for the consequences of animal or food Poisons (§§ 427—456.)

II. Structural Lesions of Veins.—Classif. IV. Class. III. Order (*Author in Preface.*)

57. *a.* Inflammation of veins occasions *redness,* or a reddish brown or violet tint of their coats. But similar changes, usually however of a more uniform character, are often produced in these vessels after death, by the imbibition of the colouring matter of the blood. Indeed, this is the most frequent source of the different shades of colour observed in the veins, these shades varying with the state of the blood, and with the period after death at which the examination had been made. The redness proceeding from this source is much more frequently met with in the veins than in the arteries, evidently owing to the constant presence of blood in the former after death. This change, however, differs, in pervading all the coats of the veins, whereas it is generally confined to the inner membrane of the arteries. Redness, therefore, unaccompanied with other changes, cannot be considered as a proof of disease.

57*. The veins, like other parts of the body, present alterations arising from the secretion of coagulable lymph or albumen. This plastic and organisable matter, in which a number of morbid formations originate, is frequently found in the veins, either extended into membranes or accumulated in amorphous masses. It is always to be viewed, particularly when connected with redness or vascular injection, as a result of the inflammatory act. The experiments which M. Gendrin instituted upon the veins as well as upon the arteries have illustrated this point.

58. *b. Coagulated lymph* is found — 1st. In the interior of the veins; 2nd, between their coats; and 3rd, on their external surface. When this is considerable, or obliterates the canal of the vessel, it generally becomes partially organised, and is changed to cellular tissue, if the life of the patient continue for some time. When the lymph is secreted in smaller quantity, so as not to interrupt the circulation in the vessel, it generally presents the form of a firm albuminous layer, without any trace of organisation; but in some instances, as pointed out by RIBES, GENDRIN, and ANDRAL, it forms a delicate membrane, and presents evident traces of organisation, being traversed by minute vessels. The surface of the vessel opposed to those membranes is sometimes, most commonly in the more recent cases, of a deep red colour; but in other cases, particularly those of older date, it is perfectly colourless. The coagulated albumen thus formed in the interior of the vein may constitute small patches merely, or small circumscribed masses, or a complete continuous layer extending through the whole of one or several vessels. The polypous concretions described by REIL (*Fieberlehre*, bk. ii. pp. 215—297) belong to the second of those varieties.

59. *c. Purulent matter* is frequently found in veins. M. ANDRAL states that coagulable lymph may gradually lose its physical characters, and be insensibly transformed into pus. That this may happen previously to the coagulation of the lymph, is possible; but we have no satisfactory proof of its occurrence, and least of all, after the coagulation of this fluid has taken place. Indeed, it must not be supposed that the purulent matter formed in the veins is generally, or even frequently, produced in this manner. When it is found in the veins, it evidently does not proceed from a transformation of the plastic matter already noticed, but from a modification of the morbid action of the extreme vessels which secreted that matter, and from a change in the vital condition and cohesion of the internal membrane of the vessel; this membrane being somewhat softened, and frequently tumified or thickened. When the purulent matter is formed from the vein itself, it is found — 1st, in the cavity of the vessel; 2nd, infiltrated between its coats, and 3rd, surrounding.

60. The purulent matter formed in the interior of the veins, is, however, more frequently conveyed there from some other part with the blood, than secreted by an inflamed vein. When detected in a vein, it is either pure, or mixed with the blood, or with coagula. When pus is found connected with coagula, it has been, in some cases, external to them, and in others, contained in them. This latter phenomenon has led to some speculation on the part of certain pathologists. M. ANDRAL believes that pus contained within a coagulum has been formed there in consequence of some peculiar modification of the blood itself. But this is merely a supposition, and is opposed by the consideration that the blood-gobule can hardly be changed to a pus-globule, either during or after the coagulation of the blood. It is much more probable that the pus, whether poured into the vessel from its inflamed internal surface, or conveyed from a distant part with the blood, but particularly when it proceeds from the former source, is first formed, the blood coagulating around it, owing to some obstruction to the circulation in the vessel, or to the effect produced by the morbid secretion on the fibrine of the blood favouring its coagulation.

61. The irritation and inflammation producing suppuration of veins, arise from various causes. These are stated when treating of inflammation of these vessels (§§ 6. *et seq.*), where I have shown that inflammation originating in a part of a vein may be propagated both towards the heart, and in the course of the smaller branches. The connexion of redness, thickening, softening, &c., of the coats of veins, with the formation of purulent matter in them, has been fully illustrated by the researches of RIBES, DAVIS, VELPEAU, GENDRIN, LOUIS, ARNOTT, LEE, TONNELLÉ, and DANCE; and similar appearances have repeatedly come before me in the examination of fatal cases of puerperal diseases. But pus is often formed in the veins, without any change of structure of their parietes; particularly in those veins which arise in parts in a state of suppuration. I have observed in several cases, in which the uterus of puerperal patients contained purulent matter either in its cavity or in its sinuses, the uterine veins, and some of the veins into which they run, nearly filled with this matter. Similar appearances have been noticed by DANCE, LOUIS, and others. ABERCROMBIE and TONNELLÉ have found pus in the sinuses of the dura mater, in cases of caries of the bones of the head, &c. Pus has often been found in the veins near diseased joints, suppurating fractures, and unhealthy stumps, by RIBES, VELPEAU, and others. BLANCHARD long ago found pus in the vena cava, in a case of abscess of the liver. M. GENDRIN found pus in the veins in the vicinity of ulcers in the intestines. M. ANDRAL has met with similar appearances. I have stated in the Article DYSENTERY, that abscess of the liver sometimes complicating that disease not infrequently proceeds from the absorption of pus from the ulcerated intestines into the veins, which, circulating into the vena porta, excites diffusive or asthenic inflammatory action, rapidly followed by the formation of purulent matter in the substance of the liver. This view is confirmed by the researches of M. RIBES, who has demonstrated that the villi of the intestines are principally composed of minute branches of veins. M. ANDRAL found, on the examination of a case of diseased intestines and liver, the vena porta and its branches lined with a false membrane. When purulent matter is formed in a part, and afterwards conveyed into the veins, as in the instances now alluded to, their coats are in some cases apparently sound, and in others inflamed or softened, or their interior is lined with a false membrane, &c. In the latter cases, either the inflammatory action has extended itself to the veins from the part primarily diseased, or the morbid secretions which have passed into them have irritated and inflamed their internal membrane, at the same time that they have induced serious changes in the blood and system generally.

62. In asthenic or cachectic states of phlebitis, or when the cause is of a poisonous or septic character, the exudation from the interior of the inflamed vein is neither plastic nor purulent, and is so entirely of an ichorous and liquid

nature as to mingle readily with the current of the circulation, and to rapidly contaminate and poison the blood and the soft tissues, and to destroy life. In such cases discolouring of the inner surface, and softening and thickening of the coats of the vessel affected, with an altered appearance of the blood — a dark, semi-coagulated or uncoagulated condition of this fluid. In these cases the blood is rarely, or if at all, coagulated, or very imperfectly coagulated in the diseased vein or veins, there is no plastic exudation on the internal surface, and no trace of pus in the vessel. The injurious operation of this ichorous exudation is accelerated by the circumstance of its failing to produce coagulation of blood in the vein; for when the exudation is plastic or purulent a coagulum is generally formed by these latter exudations; and this coagulum often prevents the extension of the inflammation and contamination of the blood and its consequences, whilst the ichorous and more liquid exudation hastens both these most dangerous or fatal results.

62*. Thus the morbid states of veins may originate either in themselves or in the parts in which the veins commence; but, whether they be thus primary or consecutive affections, they exercise a powerful influence on the system, and on distinct organs, both through the medium of the blood, and by continuity of tissue.—1st. Purulent matter secreted from an inflamed vein, or conveyed into the veins from an adjoining part, may mix with the blood, occasion febrile symptoms of an adynamic character, generally with colliquative perspirations or diarrhœa, and be thus eliminated from the circulation nearly as fast as it passes into it, by the several emunctories. 2nd. This matter, when once carried into the circulation, may be secreted from it into the parenchyma of some organ, the cavity of some joint, or even into cellular or muscular parts. 3rd. Purulent matter circulating in the vessels, whether the pus globules be metamorphosed or no, during their circulation, may induce inflammatory irritation, or such a state of the capillaries of an organ or part previously disposed to disease, as will be rapidly followed by the formation of purulent matter in such part, or by disorganisation. 4th. Inflammatory irritation excited in the internal membrane of a vein, more especially the asthenic forms, may extend in every direction to other veins, especially in that of the heart, and thus implicate other organs or parts. This diffusive form of phlebitis generally occurs in debilitated or unhealthy states of the frame, or when the disease is consecutive on other maladies, or caused by septic or poisonous agents. 5th. Inflammatory disease of the internal surface of the veins will give rise to a secretion varying with the state of the vital powers of the system, and this secretion carried along, and mixing with, the circulating current, will remarkably influence those powers and depress or otherwise modify them. 6th. Inflammation attacking all the coats of a vein is more likely to occur in a healthy body than that confined to the inner surface, and is more commonly productive of an effusion of coagulable lymph, which tends to limit the inflammation, to prevent the admixture of the products of inflammation with the blood, and thus to preserve the blood from contamination. 7th. This sthenic form of inflammation most frequently occasions obstruction and obliteration of veins; and, if the obliteration be seated in large veins, serious local and general effects may result, owing to the mechanical obstacle thereby presented to the circulation.

63. *d.* *Softening* of the inner membrane of veins is often observed, and is generally conjoined with redness when it is the result of inflammation. Sometimes the softening is so great that the inner surface of the vessel is readily reduced to a pulpy state by gently scraping it with the back of the scalpel.

64. *e.* *Thickening* of this membrane is often associated with the foregoing changes; it may be either partial or general. In the former case the inner surface of the vessel presents an uneven appearance. But softening and thickening of the inner membrane of the veins are not always connected with redness; this membrane may present either of those alterations, or both of them, accompanied with paleness or with different shades of colour.

65. *f.* *The valves* of the veins are subject to the same alterations as the inner membrane. They are often deprived of their transparency, thickened, or partially destroyed; presenting the appearance of irregular fringes crossing the cavity of the vessel, and having generally coagulated blood adhering to them.

66. *g.* *The middle coat* of veins is often *softened*, generally at the same time as the inner. When this is the case, the vessel is torn with great ease. This coat is also subject to *atrophy*. When this exists the vessel presents an extraordinary degree of tenuity. *Hypertrophy* of the middle coat has been minutely described by M. ANDRAL. When this change exists, the coat is more distinctly visible, and its longitudinal fibres more evident. When the hypertrophy is considerable, this coat loses its transparency, acquires a yellowish colour, and becomes, to a certain degree, elastic, so that, when cut across, the vein remains open as an artery, to which it closely approaches in appearance. On minute dissection, however, the middle hypertrophied coat never presents any trace of circular fibres, nor does it possess the same degree of elasticity as the middle coat of arteries. M. ANDRAL states that he once detected, as he believes, muscular fibres in the vena cava inferior, near the heart; the cava was greatly hypertrophied. The hypertrophy in this case developed a structure similar to the natural condition of the vessel in some of the lower animals. In the horse, the structure of the vena cava near the right auricle is evidently muscular.

67. The middle coat, however, may be much thickened without actual hypertrophy or development of its fibres. This may arise from a deposition of fibrinous lymph in its texture, which becomes solidified by the absorption of its serous portion. M. ANDRAL accounts for this change by supposing that a quantity of blood accumulates in its tissue; that the colouring particles are absorbed, and the white fibrine remains behind in a solid form, combined, molecule to molecule, with the coats of the vein, presenting the lardaceous appearance described by authors as a particular tissue; but instead of having recourse to this complex explanation, would it not be preferable to consider this alteration as a result of chronic inflammatory action in the coats of the vein?

68. *h.* *The external coat* of the veins is subject to the same changes as have been observed in the external coat of Arteries, and which are described in that article (§ 44.) These alterations of both the middle and external coats are commonly seen after chronic phlebitis.

69. *i.* *Ulceration* and *perforation* of the several coats of the veins are sometimes met with. M. Andral thinks that the latter is more frequently observed than the former. Perforation has been detected in the superior cava, both within and without the pericardium; in the inferior cava; in the vena porta, both within and without the liver; in the splenic vein; in the jugular; in the subclaviana; in the mesenteric veins, and in the veins of the extremities. The perforation is sometimes seen without any appearance of disease in the vicinity of the coats of the vessel, rupture taking place from external violence or muscular exertion. This form of perforation, or rather *rupture*, is most frequently observed in the vena cava and veins of the internal viscera. Instances of rupture of large veins are numerous. Schenck, Morgagni, De Haen, Doubleday, Groquier, Lovadina, &c., have recorded rupture of the vena cava. Morgagni also found the pulmonary vein ruptured. In the majority of these and other instances, the rupture was occasioned by exertion or external injury. It is probable, however, that the walls of the ruptured vessel had been previously diseased. In cases of perforation the vessel is commonly more or less inflamed, ulcerated, softened, atrophied, &c.; and here, as well as in the case of rupture from exertion or violence, the perforation occurs from within outwards; but the perforation may also proceed in a different direction; viz., from without inwards, as when the vein is seated in diseased parts, as in carcinomatous ulcers of the stomach, or is pressed upon by a tumour.

70. *k.* *The calibre* of veins may be much altered—may be increased or diminished—especially when their coats are diseased as described, the change of diameter occurring in the parts of their parietes which are affected. (*a.*) *Dilated or varicose veins* present a variety of appearances:—1st, The veins may be simply dilated, in respect either of a whole vein, or of portions of it, without any affection of the capillaries which nourish it, but more frequently with chronic inflammation of its coats: most probably the dilatation is the consequence of inflammatory action, this state disappearing, but the dilatation continuing. 2nd, They may be dilated, either uniformly or at intervals, with thinning of their parietes. 3rd, They may be dilated and their coats thickened, either uniformly or at intervals, the vessel being generally also lengthened and consequently tortuous. 4th, They may be dilated and divided into compartments by the interposition of septa or partitions, between which the blood stagnates or even coagulates. 5th, They may be dilated, divided into compartments, and the dilated portions perforated, so as to allow the blood to pass into the cellular tissue surrounding the vein. M. Andral thinks that the tumours described by the name of *erectile* are in reality nothing more than a cluster of small veins communicating with one another and with the surrounding cellular tissue by the perforations situated as now described.

71. The structure of every variety of hæmorrhoidal tumour may be referred to one or other of the foregoing varieties of dilatation or varix; but these lesions are not confined to the veins in the vicinity of the anus. M. Andral once found the external jugular altered in the manner described in the last variety. In some cases the tumours occasioned by dilated veins disappear spontaneously. When this occurs, the veins are generally obliterated. Some of the above kinds of varix, according to this pathologist, depend upon increased activity, others upon diminished activity of the nutritive process. Such, however, can be rarely the case. They are generally the results of pressure on the venous trunks into which the varicose veins pour their blood, or of some other obstruction to the circulation through the former vessel. In this case the varicose veins are not only greatly dilated and elongated, but their parietes are also hypertrophied.

72. (*b.*) *Contraction* and *obliteration* are, according to M. Andral, much more common than their dilatation. These lesions are occasioned,—1st, by obstruction in the interior of the veins; 2nd, by causes seated in their parietes; and 3rd, by mechanical compression external to them, generally from tumours, &c. The most frequent cause of the obliteration of the canals of veins is the spontaneous coagulation of the blood within the veins. That the blood may coagulate, during the life of the patient, within a vein or portion of a vein, and even within the sinuses of the dura mater, has been proved by the researches of many pathologists, particularly by Meckel, Gendrin, Bouillaud, Ribes, Andral, Cruveilhier, Arnott, Reynaud, Rokitansky, myself and others. It has occurred in several which have come before me in practice, especially in the advanced stages of low fevers, of acute rheumatism, of puerperal diseases, and in dysentery. It is often difficult to assign the particular cause of the coagulation. It is, in some cases, apparently owing to the low state of the vital energies and their effect on the blood. In other cases it is probably occasioned by the morbid state of the valves already noticed (§ 65.), or to lesion of the internal parietes of the vessel. Most frequently, however, it proceeds from coagulable lymph or pus secreted from the internal surface of the vessel; this morbid secretion adhering to the inflamed surface producing it, entangling the fibrinous and colouring parts of the blood, and thus forming a coagulum which either partially or entirely obstructs the canal. This coagulum generally varies in colour, density, and firmness of adhesion to the sides of the vessel; and it increases in bulk until the passage is entirely obstructed by it. Occasionally the coagulum becomes, in some respects, organised. Some of the pathologists whose names I have just adduced, suppose that these coagula live precisely as the veins in which they are formed, and, like every other part endowed with life, keep up a constant process of nutrition and secretion, and are also liable to become diseased.

73. The canal of a vein may be altogether obliterated, and the vessel reduced to a fibro-cellular chord. This seems to be effected in a similar way to that observed in arteries. Obliteration of large venous trunks gives rise, as observed in arteries, to a collateral circulation, kept up by means either of small veins, or of one vessel that has acquired an unusual size. The most

remarkable instance of obliteration was observed by M. Reynaud in the superior vena cava. The veins on the lateral surface of the chest were remarkably enlarged, and anastamosed freely with the epigastric veins, which were also greatly enlarged. The circulation was carried on chiefly by the vena azygos and inferior cava. The consequences of obstruction and obliteration of veins, especially œdema and dropsy, are well known. Several instructive cases of obliteration of the cavity of the vena cava, of the iliac veins, and of the sinuses of the dura mater, are recorded by Bartholinus, Rhodius, Mantissa, Bontius, Albinus, Haller, Morgagni, Hodgson, Breschet, Wilson, Tonnellé, Reynaud, Andral, and Rokitansky.

74. *l. Ossific* or *calcareous* formations are rarely met with in the coats of the veins. They have, however, been observed by Morgagni, Walter, Murray, Baillie, and Tilorier, and more recently by Macartney, Beclard, and Andral, in the femoral and saphena veins. Sometimes these concretions protrude into the cavity of the vessel, either bursting its internal membrane, or carrying this membrane before them. In either case they may at last escape into the cavity and lodge there, without any attachment to the sides of the vessel; for, in the latter case the membrane may contract behind the concretion, forming at first a peduncle attaching it to the vessel, which at last is ruptured or absorbed.

75. These concretions have received the name of *Phlebolithes*; they vary from the size of a millet-seed to that of a pea. They have sometimes been found in the centres of coagula, which had evidently been formed around them. They have been observed by Columbus, Walter, Sœmmering, John, and Langstaff. F. Tiedemann has described them minutely. Those which he has observed, as well as those noticed by the pathologists just now named, were formed in the uterine and hæmorrhoidal veins. Tiedemann and Rokitansky state that they are formed of concentric layers of the phosphate and carbonate of lime, sometimes with magnesia, united by albuminous matter, around a minute clot or coagulum; and denies that they are formed in the way which I have just stated (§ 74.); and contend that they have been produced by a sort of crystallisation, or deposition, of the earthy particles contained in the blood, around a nucleus which had formed in the nearly stagnant blood in the veins. M. Andral also considers it possible that they may have been formed in the blood itself. It is difficult to assign limits to the range of possibilities, without relation to the faith of those for whose belief they are adduced; but the question is, whether or no these concretions have ever been actually ascertained to have been formed in this manner. I believe that no such fact has ever been adduced.

76. *m. Fatty, suety, and atheromatous deposits* have been found in the parietes of veins, but not nearly so frequently as in the coats of *arteries*, where I have first described them (§§ 59, 60.). Bontius states that he has met with large masses of fat in the vena cava, obstructing its canal. I have sometimes found fatty and suety deposits between the coats of the vena porta; and M. Andral has noticed similar deposits in this vein.

77. *n. Tuberculosis* does not occur either in or on the coats of the veins. If any tubercular matter, or substance resembling this matter, be found within the veins, it can proceed only from imbibition or absorption. But before this matter can be imbibed it must be softened, or metamorphosed, and thus have lost the tubercular characters.

78. *o. Cancer* is met with in veins in two ways: — 1st. The walls of a vein may be attacked by a cancerous or carcinomatous growth, penetrated by, involved in, and closed or altered by this growth. The portal, renal, hepatic, and other veins may be thus implicated: — 2nd. The cancerous matter, especially when existing in other parts of the body, may constitute in a large vein, a variously formed mass, attached to the interior of the vessel, that may either partially or entirely fill and obstruct the canal. This cancerous formation obviously arises from the imbibition or absorption of the cancerous matter or cells into the veins, where they attach themselves and collect into masses of various sizes and forms. The œdema and swellings occurring in the last stages of carcinoma are, in some cases, attributable to this formation in the veins, and in others to phlebitis, produced by the imbibition of the cancerous matters.

79. *p. Gaseous fluids* have occasionally been remarked in the veins. In some cases they have proceeded from incipient putrefaction, but in others this could not have been the case. The vapours and gaseous exhalations from blood very recently taken, or at the time of its being taken from veins, and those found in veins after death, have not been sufficiently examined. They manifestly are such as demand a much stricter investigation than they have hitherto received. In cases of surgical operations, when large veins are divided, air not infrequently enters the veins; and if it rush in suddenly, and in considerable quantity, it is soon followed by death. The experiments of MM. Majendie and Piedagnal have demonstrated this fact conformably with what has occurred during several operations; but the mode in which this result takes place is not so evident. The air seems to act in deranging and arresting the contractions of the heart, and affecting the actions of the lungs.

80. *q. Entozoa* have been often found in the veins of the lower animals. The strongylus and filaria have been detected in the horse. M. Andral found individuals of the class Nematoidea in the vessels of a porpoise. In one only case he found Acephalocysts (hydatids) in the pulmonary veins.

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VENEREAL DISEASES. — GONORRHŒA — SYPHILIS.

— Synon. *Gonorrhœa*, *Blennorrhagia*, *Phallorrhœa virulenta*; *Lues venerea*, Fernelius, Boerhaave, Juncker, Astruc, &c.; — *Syphilis*, Sagar, Vogel, Cullen, Pinel, Young, Swediaur, &c.; — *Syphilis venerea*, Sauvages; — *Lues syphilis*, Good; — *Siphilis*, Sprengel; — *Scabies venerea*, Locher; — *Lues syphilitica*, *Morbus Neapolitanus*, *Morbus Gallicus*, *Morbus venereus*, Auct; — *Lustseuche*, *Venerische Krankheit*, Germ.; *Vérole*, *Vérole commune*, *Grande Vérole*, *Maladie Vénérienne*, Fr.; — *Mal Francese*, *lue Venerea*, Ital.; — *Pox*, *French Pox*, *Venereal disease*, *Venereal cachexia*.

Classif. — III. Class, I. Order (*Author, in Preface.*)

1. Definit. — *Specific inflammations, or ulcerations, or both, affecting primarily the organs of generation of both sexes, and very frequently the whole frame, at subsequent and sometimes at remote periods, and propagated by contact.*

2. Viewing venereal diseases as consisting of two very distinct forms—distinct in their primary character and in their consecutive effects—I shall very briefly notice, first, *gonorrhœa*, or *blennorrhagia*, or more correctly, *Blennorrhagia specialis*, or *virulenta*, and afterwards *syphilis*, or *Syphilis venerea*. The relations between these two venereal diseases have been for ages much discussed by both physicians and surgeons, and are not even now entirely disposed of. They, however, possess this in common, that they are primarily seated in the sexual organs, with very few exceptions; that they generally result from impure sexual connexion, or contact; that they are primarily either inflammatory, or ulcerative, or both; and that in many instances the frame becomes affected or contaminated by them, but in very different forms and grades, and much more

frequently in the one form than in the other. These constitutional effects render them of equal importance to the physician and to the surgeon; and although both may sometimes require surgical appliances and aids, still they may be both cured by the prescriptions of the physician only, which alone are appropriate in the consecutive states of these maladies.

3. I. GONORRHŒA.—SYNON.—*Phallorrhœa, Phallorrhœa virulenta, Gonorrhœa virulenta, Blennorrhagia, Blennorrhagia virulenta.*

4. DEFINIT.—*A specific inflammation of an acute form, affecting the mucous surface of the urinary and sexual passages in both sexes, with a copious puriform or muco-purulent discharge, propagated by contact, and in some instances occasioning severe consequences.*

5. i. DESCRIPTION. I have shown, in the article VAGINA and VULVA, that those parts are often the seats of a purulent or muco-purulent discharge, which presents the following states or forms:—1st. *Leucorrhœa*, or *Blennorrhagia*, the discharge arising from irritation or inflammatory action, of a non-specific nature; 2d. *Acute Gonorrhœa*, or *Blennorrhagia virulenta*, the discharge being the result of a specific inflammation, caused by the contact of this discharge; and 3d. *Chronic Gonorrhœa*, or *gleet*; the discharge being more mucous or less puriform, and generally consecutive upon the acute form; and unless when thus related, being distinguished with difficulty from leucorrhœa in the female; its contagious property being doubtful, unless the morbid matter acts on very predisposed parts. These forms and states of discharge are also met with in males. The *first* variety may be communicated by the female to the male, or to the former by the latter, owing to the fact of puriform discharges, the result of inflammatory irritation of mucous surfaces being capable of producing a similar state of morbid action in similar surfaces when these discharges are allowed to remain in contact with them. This result follows only in a few cases, and probably only when the recipient surface is predisposed to the infection. Thus a non-specific blennorrhagia, caused by excessive sexual intercourse, or by the discharges of the female organs, may be distinguished with difficulty from gonorrhœa, or acute specific blennorrhagia, and with still greater difficulty from chronic specific blennorrhagia, more especially when the acute specific disease is not very severe, or when it is a renewed or a repeated attack.

6. *A. Gonorrhœa in the female* has been described in the article VAGINA AND VULVA (see §§ 8. 38.). The *chronic states* of the disease have been noticed by Mr. HOLMES COOTE in his very able work on the treatment of syphilis. He remarks, "that *chronic gonorrhœa* is a disease from which the lower order of prostitutes is rarely free. It exists also among the better class, who live highly, and drink without scruple. In general it disappears when the patient is kept on moderate and regular diet, and confined to bed; but it returns upon the least excitement," &c., and is perpetuated by some internal ulcer or abrasion, notwithstanding the treatment, until this latter lesion is cured. The irritating discharge often causes an abundant growth of *soft vascular warts*, commencing at the lower part of the vagina, near the orifice, and extending at the junction of the mucous membrane and the skin towards the superior commissure. "The rapidity of this growth is quite striking. When removed by the knife they return within a few weeks, if the irritating discharge be allowed to continue."

7. Amongst other cases adduced by Mr. H. COOTE, showing that a female suffering from gonorrhœa may remain for months uncured, unless a proper examination be made, and some lesion beyond the reach of ordinary inspection be detected and treated in an effective way, the following deserves a special notice. A young woman was admitted with a large growth of vascular warts from the external organs, and a copious puriform discharge. The usual means were applied, but they increased, and were removed by excision. The discharge, however, continued, a suitable treatment was prescribed, but the warts recommenced their growth, and the patient's general health declined. The os uteri was examined by the speculum, and it was found slightly ulcerated and abraded. Caustic was applied to this part. The discharge rapidly disappeared, the general health improved, and recovery was soon complete. In another case of chronic gonorrhœa, the usual remedies were employed with temporary benefit; but a recurrence of the symptoms invariably succeeded. When examined by the speculum, a large warty growth, soft, red, and vascular, was found two inches and a half from the orifice of the vagina. This growth was two inches in length, and an inch and a quarter across the base, springing from the anterior wall. It was removed by the knife; immediate relief, and complete recovery soon afterwards ensued.

8. *B. Gonorrhœa in the Male.* This is not only a very painful and troublesome complaint, but, if injudiciously treated, it may induce changes, —or, rather, the treatment improperly adopted may occasion lesions unconnected with the disease, which may embitter, or even shorten the life of the patient. And during a somewhat lengthened period of observation I can assert, that numerous instances have become known to me of attempts made to effect a speedy cure having been followed by the most distressing and dangerous results. The complaint usually commences from three to ten days after morbid contact; and the shorter the period of its incubation the more severe the attack; the stronger dose of the virus hastening the effects. A slight itching is at first felt, then an irritation at the opening of the urethra, and afterwards a smarting pain, more or less severe, upon micturition. The lips of the urethra become tumid; a thin discharge, at first scanty, but soon afterwards more copious and puriform, flows from the passage. The corpus spongiosum urethræ becomes thickened and unyielding, owing to inflammatory exudation into it; and when erection of the penis occurs, a bending downwards, or chordee, is produced. Hæmorrhage sometimes takes place during this state and affords partial relief; and occasionally irritation extends from the urethra to the glands of the groin, causing slight swelling, which very rarely goes on to suppuration, unless in scrofulous subjects.

9. A form of gonorrhœa—*gonorrhœa sicca* —is occasionally met with, both in the male and female, and has been described by Mr. ACTON and Dr. DRUITT; in which the mucous membrane of the female organ is red, swollen, and

tender, but free from discharge. In the male there are severe scalding and pain on passing the urine, painful erections, the lips of the urethra being red and swollen. This form of the disease has been called dry clap.

10. *C. Secondary effects and complications or consequences of Gonorrhœa in Females.*—Owing either to neglect, to improper treatment, or to constitutional vice, or to neglect of proper regimen, several very serious consequences ensue upon the gonorrhœal disease. Most of those which occur in the *female* have been noticed in the articles UTERUS AND ITS APPENDAGES (§§ 43. 53. 122. *et seq.*), and VAGINA and VULVA (§§ 8. 13. 38.). These consequences are, chronic gonorrhœa, suppuration or abscesses in the labia, soft vascular warts (§§ 6, 7.), gonorrhœal inflammations of the cervix uteri, extending to the cavity of it and of the uterus along the Fallopian tubes to the ovaries, and even to the peritoneum; and, in rare instances, to the uterine veins. Gonorrhœal ophthalmia, and gonorrhœal rheumatism occur not less frequently in the female than in the male.

11. *D. The complications of gonorrhœa* sometimes observed in males are, 1st, *Balanitis* (from Βαλανος, glans), or *gonorrhœa externa*, is an inflammation of the surface of the glans and inside of the prepuce, with profuse purulent discharge and excoriation of the cuticle. This affection may be a complication of gonorrhœa, or may exist independently of it. In the former case it is produced by the gonorrhœal virus; in the latter by the want of cleanliness, and by the excoriations caused by the secretions of the part, which have become acrid by retention. In these latter cases the excoriations may be mistaken for chancre. 2d, *Phymosis* and *Paraphymosis* occasionally arise, owing to the swelling of the glans and prepuce. Œdema of the prepuce presents a semi-transparent or diaphanous appearance. These states, although often complicating gonorrhœa, not infrequently occur independently of it, especially as a consequence of self-pollution; and in some instances they lead to very serious results. They furnish additional reasons, to others which may be adduced, as to the propriety of circumcision during infancy. 3d, Irritation or inflammation of the lymphatic vessels, extending to the glands of the groin, is a common association of the disease; but the affection of the lymphatics may be so slight as to be imperceptible, although the glands may be much swollen, inflamed, or even suppurate. 4th. The mucous follicles of the urethra may be inflamed and obstructed, and may even suppurate and burst either into the urethra, or externally, or both. In these cases, very serious obstruction to the discharge of urine may occur. 5th. The inflammation may extend along the urethra to the prostate gland and neck of the bladder, and even along the ureters to the kidneys; or it may give rise to acute abscess of the gland and great suffering, especially during micturition, to strictures, &c. 6th. More frequently, inflammation extends along the vas deferens, causing swelling of the epididymis, or swelled testicle.

12. Gonorrhœa is always most severe on its first occurrence, and in young and robust subjects and in the irritable and scrofulous constitutions and habits. In these it is often attended by severe inflammatory fever and disorder of the urinary functions; and it may even prove dangerous to life, by inducing extensive inflammation and abscesses in the vicinity of the prostate and bladder. "But after repeated attacks the urethra becomes inured to the disease, and each subsequent infection is generally (although not always) attended with fewer of the symptoms of acute inflammation. In some instances, the constitutional affection is extremely anomalous, and characterised by severe and continuous rigors," or by slight remittent or intermittent rigors and paroxysms of febrile reaction.

13. These complications, and more especially those about to be noticed, are chiefly to be ascribed to the local and constitutional influence of the virus or infecting agent, an influence manifested in some cases more prominently than in others, and not observed in cases of simple urethritis. Certain of the above complications are, however, merely the local extension of the gonorrhœal inflammation, often owing to the causes above alluded to. Other complications or consequences of the disease are of a constitutional and very serious nature. Mr. HOLMES COOTE, in a work published whilst 'this was being written, corroborates the view I have taken in the article VAGINA and VULVA (§§ 8. *et seq.*), as to the specific nature of gonorrhœa. This very able and rising surgeon remarks,—"Is the disease the consequence of the application of a simple irritating fluid to the mucous membrane, or is there a morbid poison acting on the parts locally, and capable of being absorbed into the system? I must confess there appears to me to be a most marked difference between simple urethritis and true gonorrhœa, as we daily see it among those exposed to contagion." Gonorrhœa in some cases occasions peculiar secondary affections, which never proceed from simple urethritis; and not only is it occasionally followed by the local complications just mentioned, but also by one of the very severest forms of inflammation of the conjunctiva (see art. EYE, *Gonorrhœal Inflammation of*, §§ 56. *et seq.*), by the most severe and obstinate form of rheumatism (see art. RHEUMATISM, *gonorrhœal* (§§ 44. 163.), and by a form of papular eruption. The occurrence of purulent ophthalmia, or of rheumatism, or the extension of inflammation from the urinary bladder along the ureters to the kidneys, is of a most serious nature, as respects both the immediate effects and the more remote consequences.

14. ii. TREATMENT. — *A. Of Gonorrhœa in the Female.* — A copious use of diluents and demulcents; a farinaceous and vegetable diet; avoidance of fermented and spirituous liquors, and of salted provisions; a recourse to alkaline and refrigerant substances in mucilaginous drinks, and repose on a cool couch or mattress, are generally sufficient to remove the severer symptoms in a few days, especially when aided by the following local treatment judiciously advised by Dr. DRUITT: — "During the acute stage, rest in the recumbent posture, fomentations of decoctions of poppy-heads with chamomile flowers, frequent ablution, lubrication with lard or cold cream, and very frequent sponging with a weak solution of alum, a piece of lint dipped in which should be inserted between the labia, with laxatives and diaphoretics, are the measures until heat, pain, tenderness, subside; afterwards injections of nitrate of silver, and sulphate or acetate of zinc should be used, as recommended for the other sex, and they should be continued for some time after all discharge has

ceased." (DRUITT's *Surgeon Vade-mecum*, &c., p. 175.)

15. If the disease become obstinate and *chronic*, the vagina and cervix uteri should be examined by the aid of the speculum, as the disease may be prolonged by lesions of the cervix or of its canal; and when this is the case, the means advised for such lesions, in the article UTERUS (§§ 124, 125.) should be resorted to. In *chronic* cases, the solution of sulphate of alumina, or decoction of oak-bark, or both conjoined, may be used as a lotion. Copaiba and cubebs may be given thrice daily in a mixture with mucilage, the spirits of nitric æther, and either mint-water or camphor julap, in the chronic, as well as in the advanced progress of more acute cases. In the former, preparations of iron, especially the tincture of the sesquichloride of iron, or the tincture of the ammonio-chloride may be preferred. In irritable and sanguine temperaments, camphor conjoined with nitrate of potash, with acacia and henbane, is often of much service, and may be prescribed in the form either of pills of a mixture or draught.

16. *B. Treatment of Gonorrhœa in the Male.* — (*a*). Dr. DRUITT has advised, as a *prophylactic treatment*, that a person exposed to the chances of infection should wash out the anterior part of the urethra with a syringeful of some astringent lotion. I much doubt the complete success of this plan, or of the more usually adopted one of micturating immediately after sexual connection: both plans may, however, be often successful. If any fissures or excoriations are perceived they may be touched with lunar caustic, and dry lint may be applied.

17. (*b*). *The abortive treatment of gonorrhœa*, or an attempt to cut short the attack by means of strong injections, has been advised by some experienced surgeons. Ten grains of nitrate of silver, or four grains of the chloride of zinc, to the ounce of distilled water, have been prescribed with this object, when the disease is only commencing, and before scalding on micturition is experienced, or when the acute symptoms have passed. Mr. ACTON employs the nitrate of silver, and has recourse to only one or two injections performed by himself with due precautions. He never prescribes this treatment in cases of a first infection; and he states that he has not observed the injurious effects which have been supposed to result from it. For the modes of using, and the precautions to be taken when using, this treatment, I must refer the reader to Mr. ACTON's able work. Mr. HOLMES COOTE considers it not quite free from danger to the urethra; and he remarks that it should be remembered that it is in cases where the structures of the urethra are damaged that stricture occurs; the usual effects of gonorrhœa, in their acutest form, pass away, if not aggravated, without leaving any structural change. "At the commencement of the disease large doses of the tinctura ferri sesquichloridi, or of the citrate of iron and quinine, have been pronounced effectual in cutting short the discharge; and such remedies possess the advantage of inflicting no damage, if they do not produce the anticipated amount of good."

18. (*c*). *In the first or early stage of gonorrhœa* the antiphlogistic diet and regimen should be strictly enforced; and demulcents containing alkalies and refrigerants freely allowed, with the other means already noticed (§§ 14. *et seq.*). Cooling aperients ought to be taken from time to time; walking and horse-exercise should be prohibited, and the patient confined to a cool sofa or mattress. The penis and scrotum should be supported by a suspensory bandage, and be kept constantly wet with tepid or cold water. If the acute symptoms have not appeared, M. RICORD recommends, according to Dr. DRUITT, the following plan, in order to arrest the course of the disease:—"Let the patient inject the urethra regularly once in every four hours with a solution of two grains of nitrate of silver in eight ounces of distilled water; let this be repeated twelve times, desisting, however, sooner if the discharge is rendered thin and bloody, which is the ordinary effect of the nitrate. Then let an injection of the sulphate of zinc be substituted, and be continued until the discharge ceases. At the same time the patient should take a mild aperient, and after it, three times daily, a dose of copaiba or cubebs." He should continue a strictly antiphlogistic regimen for a week or ten days after all trace of the discharge has disappeared. The penis should be wrapped in a piece of rag dipped in water. Dr. DRUITT proceeds to remark, that the "manner of injecting is of no small consequence, as the efficacy of the lotion depends entirely on its application to the whole of the diseased surface; and, as Dr. GRAVES observes, the ordinary opinion that gonorrhœa is limited to the anterior extremity of the urethra is unfounded and mischievous. The patient should be provided with a glass syringe, with a long bulbous extremity, and having filled it, should introduce it for about an inch with his right hand. Then, having encircled the glans penis with his left forefinger and thumb, so as to compress the urethra against the syringe, and prevent any of the fluid from escaping, he should push down the piston with his right forefinger, letting the fluid pass freely into the urethra. The syringe should now be withdrawn, but the orifice should still be compressed, and the fluid be retained for two or three minutes; after which, on removing the finger and thumb, it will be thrown out by the elasticity of the urethra. It is always worth the surgeon's while to *see* that the injection is properly used."

19. (*c.*) *In the second stage* the diet and regimen already advised should be continued. The patient may drink soda-water, barley-water, linseed tea, gum-water, and other mucilaginous fluids, containing alkaline carbonates and sedatives, and the bowels should be kept freely open. If much pain or chordee be complained of, the following pills may be taken night and morning, and the mixture occasionally through the day:—

No. 372. ℞ Camphoræ ℈j; Potassæ Nitratis ʒjss.; Extr. Hyoscyami ʒj.; Mucilag. Acaciæ q. s. Misce et divide in Pilulas xxxvj. Capiat duas vel tres pro dosi.

No. 373. ℞ Potassæ Bi-Carbon ʒjss.; Potassæ Nitratis ʒjss.; Spirit Ætheris Nitrici ℥ss.; Tinct. Hyoscyami ʒij.; Mucilag. Acaciæ ℥jss.; Syrupi Tolutani ℥ss. Mist. Camphoræ ad ℥viij. Misce. Sumantur Cochl. ij. vel iij. ampla ter in die.

No. 374. ℞ Liq. Ammoniæ Acetatis ℥j.; Spiritus Ætheris Nitrici ℥ss.; Potassæ Nitratis ʒjss.; Tinct. Hyoscyami ʒij.; Mucilag. Acaciæ ℥j.—Syrupi Althææ ʒvj.; Mist. Camphoræ ad ℥viij. Misce. Capiat Cochl. ij. vel iij. Larga, 4tis vel 6tis horis.

20. The last of these prescriptions will be found serviceable in the most acute or inflammatory cases, and when the urinary organs become affected. In these cases a number of leeches should

be applied to the perinæum, or above the pubes, or near the groins. In this stage of the disease injections should not be prescribed. For first attacks, and in young, strong, plethoric, or irritable subjects they may be injurious. Refrigerants, diluents, demulcents, alkalies, and sedatives, are then chiefly required.

21. Dr. DRUITT advises that the bowels should be opened by a dose of calomel at night, and some castor oil in the morning; and that a grain or half a grain of calomel, and one eighth of a grain of tartar emetic, and ten grains of Dover's powder, should be given every night whilst there is much pain and chordee. As soon as the patient is free from fever, he should take copaiba or cubebs. The former, in capsules, may be given before a meal, as it is then not likely to cause eructations. Mr. ACTON prescribes copaiba and cubebs in the following combinations:—

No. 375. ℞ Bals. Copaibæ ʒvj.; Magnesiæ Calcinat. ʒjss.; Extr. Hyoscyami ʒss.; Pulv. Camphoræ ʒj.; Theriacæ ʒiij.; Micæ panis ℥jss. Misce. Fiat Electuarium. Capiat Cochl. j. minimum ter in die.

No. 376. ℞ Pulv. Cubebæ ℥jss.; Bals. Copaibæ ℥ss; Extr. Hyoscyami ʒss.; Magnesiæ Calcin. ʒjss. Pulv. Camphoræ ℈ss.; Theriacæ ʒj. Misce. Fiat Electuarium. Capiat Cochl. j. min. ter in die.

22. The last of these is altered from Mr. ACTON's prescription, and the dose of camphor reduced one half. Cubebs, when taken in very large or frequent doses, generally diminishes the discharge, and remarkably relieves the other symptoms in a short time; but when employed alone, the disorder often returns after some time, especially if it be relinquished, or the dose much diminished. Cubebs should therefore be conjoined with copaiba, or other substances, in mucilaginous mixtures; or the tincture of cubebs may be substituted for the powder, as in the following draught:—

No. 377. ℞ Copaibæ ♏xv.; Mucilag. Acaciæ ʒjss.; Pulv. Cubebæ ʒj.; (vel Tincturæ Cubebæ. ʒjss.); Spirit Ætheris Nitrici ♏xxv.—Liquoris Potassæ ♏xv. Aquæ Menthæ Piperitæ, et Mist. Camphoræ, āā ʒv. Misce. Fiat Haustus ter in die sumendus.

23. *d.* Several unpleasant *complications* occasionally appear in the course of this stage. Painful *erections* and *chordee* are the most common. They may be treated with tepid or cold application, and by narcotics and refrigerants given internally. Antimonials may be prescribed with small doses of camphor, nitre, and henbane or opium; and a little extract of belladonna, or lint wet with the tincture of belladonna may be applied over the course of the urethra at bed time. *Hæmorrhage* from the urethra often affords relief. If, however, it becomes excessive, it may be readily checked by cold applications, and by pressure. Inflammation of the mucous glands, or in the cellular tissue external to the urethra, may be poulticed; and if *abscesses* form, they should be opened early, or as soon as they obstruct the flow of urine. *Swellings* of the glands in the groin are generally removed by rest, and seldom require the application of leeches.

24. *If Epididymitis*, hernia humoralis, or swelled testicle, supervene, Mr. H. COOTE believes "that the best plan is to strap the testicle at once, after the fashion represented in the work of Mr. ACTON. A layer of collodion over the strapping is often useful. The relief thus afforded to the patient is surprising, and the swelling will often subside to one half in twenty-four hours. The application of cold, either by cold lotions or by the careful use of pounded ice and salt in a bladder, tends to relieve pain, subdue the inflammation, and reduce the swelling. When in consequence of pain this treatment cannot be carried out, we may fall back upon the practice of leeching the testicles, and of administering emetics. Nothing reduces inflammation of these organs more promptly than this, but the treatment is severe. When induration remains after the acute stage has passed, pressure is more serviceable than frictions, whether of mercury or of iodine; both may, however, be employed." (H. COOTE, *Report, &c.*, p. 34.)—Since 1824, for the cases respecting which I have been consulted, I have ordered an emetic, afterwards an aperient, and the mixture (No. 374.) last prescribed; and, two or three days afterwards, full doses of the iodide of potassium in the above alkaline mixture (No. 373.). Iodine is rarely of use when employed externally in this disease.

25. *d. In the third stage*, or when the acute symptoms have subsided, the injections advised in the first stage may be prescribed. If these fail, or if the discharge returns, injections with weak solutions of the sulphate or acetate of zinc or of copper, or of the bi-chloride of mercury, and with the addition of vinum opii, may be employed. These solutions should vary in strength with the circumstances of the case; but if either of these occasion severe pain, their strength ought to be much reduced.

26. If the disease becomes *chronic*, and passes into *gleet*, a long-continued treatment is generally required to remove it, however judicious the means may be. The habits of the patient should be strictly regular and temperate, and pills made with venice turpentine, or with tar, or with copaiba and liquorice powder, may be *employed*. About thirty years ago I *prescribed* magnesia in the preparation of pills with these substances, but they became so hard after a short time as to be often passed from the bowels undissolved. If these fail, camphor, with sulphate of iron, or with sulphate of zinc, kino, or catechu, and small doses of creasote, may be taken in the form of pills; or the tincture of the muriate of iron, with the tincture of quassia or of calumba, may be given in any suitable vehicle. If micturition be frequent or painful, or if the urine deposits any mucus, the preparations of buchu, pareira, and uva ursi, are generally indicated. In most of these cases the cold salt-water douche, or local bath, sea-bathing, regular and generous living, suitable tonics, and chalybeate mineral waters, will be of essential service. If the disease still remain obstinate, or if involuntary emissions occur, blisters to the perinæum, the introduction of a bougie, or other means which fall within the province of the surgeon, may be employed.

27. *e.* The *diet*, *regimen*, and *beverages* of the patient during acute, subacute, and chronic gonorrhœa, should be strictly enforced. In the *acute* and *subacute* stages, constant repose on a cool sofa or bed, and on a hair mattress; a diet restricted to vegetable or farinaceous food in very moderate quantity; the careful avoidance of active exercise, more especially of exercise on horseback, and of heating beverages. The fluids taken should be cooling and demulcent. Weak black

tea, barley-water, weak veal soup, effervescing magnesia-water, or potash or soda-water, &c., may be allowed. In the *chronic stage*, or state of gleet, tar-water, spruce-beer, Dantzic spruce, the infusion or decoction of the tops of the spruce-fir, camphor-water, with nitre, &c., may severally be taken. They will tend to promote the effects of the medicines prescribed for this state.

II. Syphilis — *Siphilis, Sprengel and H. Mayo — Lues venerea*, Auct.

28. i. History of. — Medical writings furnish no precise or undoubted accounts of this distemper until the appearance of the epidemic towards the close of the fifteenth century in the south, and soon afterwards through all, of Europe. In that and the following century, venereal eruptions occurred so commonly after infection, not only by sexual congress but also by contact, that the disease was regarded as a contagious malady affecting primarily and chiefly the skin. At the present day, and for a long time past, these eruptions and the other affections which sometimes accompany or follow them, are much less frequent, and appear after a longer period from the primary infection than they did formerly. This circumstance, as well as some other modifications of the characters of the distemper, as described by the earlier writers, may be referred to the long transmission of the distemper by contagion, the venereal poison having thereby lost something of its original influence, and to its having, during many ages, been almost exclusively transmitted by the intercourse of the sexes, and without general infection, or not by the emanations or secretions from the secondary affections, unless under peculiar circumstances hereafter to be noticed (§§ 109. *et seq.*).

28*. As to the long agitated subject relative to the early history of syphilis, it is quite unnecessary to enter further than to notice a few of the authorities who have supported opposite opinions regarding it. Galesius (*De Podagra et Morbo Gallico*, 4to. Bon. 1637); Beckett (*Philosoph. Trans.* No. 357. 365.); Plenk (*Beobachtungen, &c.* ii.); Hensler (*Geschichte der Lustseuche &c.*, b. i. 1783); Klein (*De Morb. vener. curat. in India Orientali*, Ham. 1795); Stoll (*Prælect.* p. 94.; Thierry, Richter (*Chirurg. Biblioth.* v. i. p. 163.); and many others, have severally contended, but with insufficient evidence, for the existence of syphilis from remote antiquity, but in a sporadic form, before the discovery of America, and before its occurrence in an epidemic form at Naples in 1495. De Blegney even believed that it was known to Moses; F. Valesius (*Ann.* iv. p. 57.), that it caused the baldness and ulcerations of the face ascribed by Tacitus to Tiberius; Lefevre (*Hufeland, N. Ann.*, b. i. p. 309.), that it had existed 800 years before Columbus; Schenck (*Observat.* l. vi. 217.), that it had been observed as far back as 1270); Alcazer (*Haller's Biblioth. Med. Pract.* ii. 197.), that it was an ancient disease, and that it was epidemic in 1456; Schaufus, that it was brought from India into Europe by the gipsies; Clavigero (*Storia Antica*, t. iv. 1781), that it was not imported from America; and Delius, that it was an ancient malady, but was sporadic, and became epidemic by its complication with camp diseases at the end of the fifteenth century.

29. The first author who contended that syphilis was a variety of leprosy was M. Cumanus, in 1495. He considered it identical with the leprosy of Campania, described in the 13th century by Papia of Lombardy. A similar opinion was entertained by S. Aquilanus in 1497, by Camperio, Lange, Biondi, and Dodonæus, early in the 16th century; and was supported by Zacutus Lusitanus, Maynwaring, and Musitanus in the following century.

30. That the distemper was brought from America by the followers of Columbus was asserted by several writers in the commencement of and early in the sixteenth century, especially by N. Poll, L. Schmauss, et U. Ab Hutten, and by many others. This opinion as to its origin was very ably supported by Astruc, and Girtanner (*Abh. von der Lustseuche, &c.*). It was, however, denied by Sanchez (*Abh. Ueber der Ursprung Venussenche, &c.*, Bremen, 1775), who argued that an indigenous malady could hardly be brought to Europe and there become epidemic; by Sarmicuto (*loc. cit.* i. p. 67.); and by Hensler (*Geschichte der Leustseuche die zu Ende dis. 15. Jahrh. in Europa Ausbrach.* Altona, 1783). More recently Desruelles (*Op. cit.*) has contended for the antiquity of the disease, and denied the importation of it from America. Desportes (*Hist. de Malad. de St. Dominique*, t. ii. p. 61.), Lagrange, Sloane, and numerous others, however, have shown, that a disease resembling syphilis was prevalent in Hispaniola when visited by the Spaniards, and was brought into Europe by them from 1493 to 1495. Astruc states that in the Neapolitan, or rather in the Spanish army, there were not a few of the soldiers who, returning from the Indies, either in the first voyage with Columbus, in the month of March, 1493, or in the second with A. de Torrez, in the beginning of 1494, or in the third with P. de Margarit, at the end of the same year, were still infected with the venereal disease, or at least had contracted it in Spain, after it had been brought by others into Europe. And therefore it is by no means strange that many of the Neapolitans should be infected with the same distemper, as they served under the same colours, and conversed with the same females who followed the camp. Hence he concludes, that the disease was communicated from the Spaniards to the Neapolitans,— from both to the French,—and from all three to the other European nations, and to most of the people of Asia and Africa; though he believes that, under the torrid zone, there are some countries where it seems to have been a native and an endemial disease. (*De Morbis Veneris*, vol. ii. 4to. Paris, 1740, lib. i. cap. &c.) Sanchez de Ribeiro, in 1765, contended that syphilis originated in Europe, and assumed the epidemic form in 1493. He was the first to shake the belief in the American origin of the malady, and was followed by Hensler, who believed it to have been intimately connected, in origin and nature, with the leprosy of antiquity, which he regarded as the precursor, in western Europe, of syphilis at the end of the 15th century. Richter (*Chirurg. Biblioth.* b. i. p. 163.), however, contends that syphilis was an ancient disease, and was imported into America by the Spaniards. But there is no sufficient evidence of such importation by the Spaniards, whereas evidence is furnished by Astruc

and others, that a similar distemper was prevalent in the West Indies and America amongst the natives when first visited by Columbus, and that they treated it with the same medicines as were found most successful subsequently by the Spaniards and other Europeans. That this distemper existed in America, in Western Africa, and probably also in other inter-tropical countries, before the discovery of America, appears to have been conclusively shown by numerous writers, although in more or less modified forms, according to race, modes of life, and numerous circumstances; and that it still exists in these forms, as a most prevalent and contagious distemper, in these countries, cannot be doubted. It was considered as being not improbable that the milder states of the disease prevalent in some of these countries, and in Hispaniola, when first visited by the Spaniards, assumed in the latter, as well as in other Europeans, a much more severe character, especially when they became associated with scurvy, or with leprosy, then so prevalent in Europe, or with other epidemic or endemic diseases, or when the distemper first infected different races from those in which it had first originated, using different kinds of food, adopting different modes of living, and observing very different social and domestic habits, &c. That the disease is modified by these causes, by climate and by treatment, even at the present day, cannot be disputed, —and hence, most probably, it may have resulted from those distempers, which are denominated syphiloid by several writers, which are characterised by the most prominent features of constitutional syphilis, and which are different forms of syphilitic cachexia, arising out of those circumstances, in connexion with differences of race, with climate, habits of life, modes of communication, &c. (§84. *et seq.*).

31. In addition to these opinions as to the history of syphilis, another had been from an early period entertained by several writers, but had received little attention until it was supported by D. C. G. Gruner, who has inquired into the early history of syphilis with great learning and candour; and has described the symptoms of the disease, as it appeared in Italy in 1493 and 1494, and the ways by which it was propagated. From his account, or rather, according to the authorities he has adduced, it appears that syphilis was then a much more acute, rapid, severe, and complicated distemper, than in modern times; and that it was communicated in its several constitutional forms, not only by sexual intercourse, but also by kissing, by sleeping in the same bed, by contact, especially with parts covered by eruptions, by shaving with the same razor, by drinking from the same vessel, by inhaling the breath of the infected, by the clothes, particularly woollen, of the diseased, and even by contact of any part of the body. The sudden appearance and rapid extension of the malady, the medical men of the day were at a loss to account for. As to the opinion that diseases of the genitals were at all times an occasional or sporadic result of impure sexual connection, Gruner remarks, "Hoc quidem certum ac indubitatum est, homines nunquam sibi temperasse a venere vulgivaga, ideoque ab historicis stupenda narrari exempla, quin sub finem seculi xv increbrescere vitia genitalium venereis similia, sed ea fere leprosa. Hæc vero, nisi de verbis disceptare volumus, ut ferri quidem et defendi possunt, ita etiam corpora fuisse apta ad recipiendam contagionem affinem satis declarant. Medici enim et chirurgi horum temporum bene versati in cognitione morborum cutaneorum, cum maximæ lepræ, tantum non omnes novitatem morbi mirantur et stupent, et similitudine quorundam symptomatum opinantur eam esse lepræ proximam, vel in eam tandem transire; leprosi vero Gallico morbo correptos cane pejus ac angue fugiunt et procul abesse jubent. Ex hoc, ni omnis fallor, certissime colligitur, fœdum morbum non fuisse omnino eundem, sed paullo diversum et a causa quadam insolente productum. Quam in venere impura per se latuisse vix affirmandum est." *(Op. cit. xv.)*

32. Gruner contends that the opinion as to the introduction of Syphilis in Europe from America cannot be sustained, inasmuch as it cannot be shown, that the distemper was in 1493 endemic in America in the form in which it existed in Italy; that, if the foul ulcers and buboes observed in the latter existed in the former country, they should have been manifest in those aborigines brought to Europe; and that a malady imported into Spain by a few individuals from America, could not in the same year have been transmitted to Italy and there so rapidly spread the devastation which it was said to have produced. He therefore asserts that the evidences furnished by Fulgosus, Sabellicus, Nauclerus, Leo Africanus, and others respecting the expulsion of the Moors and Jews from Spain in 1492, and in the five preceding years, and the fearful distresses and distempers consequent upon this expulsion, are sufficient to account for the appearance and rapid dissemination of syphilis in Italy and in other countries. These writers state that the disease was brought from Africa into Spain, and that, when Ferdinand expelled the Moors and Jews from Spain, from 1487 to 1492, it assumed a severe and epidemic form, owing to the distresses experienced by these emigrants. It is expressly stated by Nauclerus, "In itinere abeuntium Judæorum triginta millia pestis absumsit. Eodem tempore etiam Marrani (Moors) Romæ ad portam Appiam morati effecerunt, ut in continenter pestis invaserit urbem, mortuique sunt quam plurimi ex peste et contagione dictorum Marranorum, de quibus tota urbs impleta est." Gruner therefore infers from these and other authorities that the diseases to which the genitals were liable, owing either to impure connexion or to leprosy or other causes, were developed into a pestiferous form by the distresses and other circumstances connected with the expulsion and emigration of the Moors and Jews, that the distemper in this malignant form was disseminated throughout Italy,—the French army which invaded Italy in 1493, bringing it with them on their return to France, and that it spread rapidly from thence and from Italy to other countries.*

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* As it is manifest, in the present state of our knowledge, that syphilis is caused by a specific poison or contagious agent, originating, as far as we know, in the secretions of the sexual organs, and generally communicating the disease by sexual intercourse, but sometimes also by contact under different circumstances, and in different stages of the malady, and even to the fœtus; that syphilis will not produce gonorrhœa, although both diseases are often associated; and that gonorrhœa will not give rise to syphilis, although like syphilis it is generally caused by sexual intercourse, but capable of being propagated by contact in other ways; so it follows, that conclusions respecting the origin of the one disease can-

33. The question still remains unanswered as to the origination of the syphilitic disease brought by the Moors and Jews from Spain into Italy. It has been, as stated above (§§ 30—32.), acknow-

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not apply to that of the other. For being thus distinct, although sometimes associated, and generally propagated in the same way, it is very probable that these distempers may have originated in different epochs and in different circumstances. Admitting that syphilis was brought into Italy in 1492 by the Moors and Jews expelled from Spain, when it was developed into an epidemic and an acute distemper either by the sufferings and other circumstances of these emigrants, or by its being engrafted on or becoming associated with some other malady, as leprosy, camp fever, scurvy, &c., according to the evidence furnished by Gauner; or that syphilis was imported in the following year into Europe from Hispaniola, where it had long existed as a specific disease, although manifesting various modifications in its primary and consecutive phenomena both there and still more remarkably in Europe, still there appears to be no sufficient evidence that *gonorrhœa*, also a specific disease, and known now as such, and existing most frequently unconnected with syphilis, either first appeared in connexion with this latter distemper, or existed previously to it. It is certain, however, that from an early period of the certain history of syphilis, or early in the 16th century, that gonorrhœa was mentioned as a frequent complication, or prominent symptom of syphilis. It is very difficult to determine anything conclusive as to the origin of virulent or specific gonorrhœa, as most probably a puriform discharge was not an uncommon result of impure connexion, or of sexual intercourse with unclean, leprous, or otherwise diseased females in the early and middle ages. The descriptions of disease by most of the writers of these ages, as well as of those of the 15th and 16th centuries, are so vague as to give rise to grave doubts as to their precise application, and although some of the accounts given by authors long before the period at which this distemper was developed in Italy seem to apply to gonorrhœa, yet their accounts are not complete in some respects, and fail in mentioning the association of a copious discharge, and of certain other contingent symptoms and consequences of the disease, although other symptoms which are certainly characteristic of it are fully stated.

i. *The testimonies* which have been adduced as to the existence of Syphilis in Europe before the discovery of America have been considered as conclusive by Becket, Hensler, Swediaur, B. Bell, Desruelles, and altogether insufficient by Astruc and numerous writers in the 16th and 17th centuries. I may notice the following amongst the former: — Gulielmus de Saliceto, in 1270, states (in l. i. cap. 42. *De Apostemate in inguinibus*), "Hæc ægritudo vocatur bubo vel dragoncella inguinis vel apostema inguinis * * * * et aliquando cum accidit homini in virgâ corruptio propter concubitum cum fœdâ muliere, aut ob aliam causam. Itaque corruptio multiplicatur et retinetur in virgâ, unde non potest natura mundificare virgam aut locum, primò propter multam plicaturam partium illarum et propter strictam viam illius loci, unde redit et regurgitat materia ad locum inguinum propter habilitatem loci illius ad recipiendum superfluitatem quamlibet, et propter affinitatem, quam habent hæc loca ad virgam." — Cap. 48. "*De Pustulis albis vel rubris, et de Milio et de Scissuris, et de Corruptionibus vel hujusmodi, quæ fiunt in virgâ vel circa præputium propter coitum cum fœtidâ muliere, aut cum meretrice, at ab aliâ causâ.*"

Lanfranc, of Milan, in 1290 (*in Artis Completæ Chirurg.*, tract. iii. doct. ii. cap. 11.), asserts: "Sæpe provenire apostema in inguine propter ulcera virgæ et pedum, propterea quod locus est descensus humorum ad illa loca, et tunc non est ita timendum, propterea quod venire tunc potest sine multâ corporis plenitudine, et absque eo quod decursus humorum maxime ibi fiat." In tract. iii. doct. iii. cap. 11., *De Ficu, et Cancro, et Ulcere in virga virili*, he adds: "Ficus est quædam excrescentia, quæ nascitur supra præputium virgæ, et aliquando super caput, quæ quidem aliquando est mollis, ut de phlegmaticâ generatâ materiâ; aliquando dura ut de Melancholicâ; quæ si corrumpatur, transit in cancrum. Cancer fit in virgâ, sicut in aliis diximus fieri membris: ulcera veniunt ex pustulis calidis virgæ supervenientibus, quæ postea crepantur; vel ex acutis humoribus locum ulcerantibus; vel ex commissione cum fœdâ muliere, quæ cum ægro talem habente morbum de novo coierat."

Bernard Gordon, in 1300, Professor of Medicine at Montpelier, remarks (*Lib. Med.* part. vii. cap. 5., *De Passionibus Virgæ*): — Passiones virgæ sunt multæ, sicut sunt apostemata, ulcerationes, cancri, inflatio, dolor, pruritus. Causæ sunt exteriores aut interiores. Exteriores, sicut casus, percussio, et jacere cum muliere, cujus matrix est immunda, plena sanie, aut virulentia, aut ventositate et similibus corruptis. Si autem causa fuerit intrinseca, tunc sunt sicut humores corrupti, et mali descendantes ad virgam, et ad partes inferiores, inducentes prædictus passiones."

John of Gaddesden, in 1310 (*Rosa Anglica, cap. de curâ ulcerum virgæ*) states: "Ulcera virgæ virilis contingunt vel ex coitu cum juvenculâ, vel ex coitu cum menstruatâ, vel ex retentione urinæ et spermatis."

Guido de Cauliaco, of Montpellier, in 1360 (*Chirurg. Mag.* tr. vi. doct. ii. cap. 7.), has a chapter, "de Calefactione et Fœtiditate in virgâ propter decubitum cum mulierâ fœtidâ."

Valescus de Taranta, Professor of Montpelier in 1400 (*Phil.* l. vi. cap. 6., *De Ulceribus et Pustulis virgæ*), describes these as follows: "Causæ possunt esse primitivæ, aut antecedentes, aut conjunctæ. Primitivæ, ut est vulnus, vel attritio, vel coitus cum fœtidâ, vel immundâ, vel cancrosâ muliere; alia causa potest esse portâsse femoralia nigra, fœtida et immunda; alia causa potest esse materia spermatica vel corrupta retenta inter caput virgæ et præputium, vel mali humores ibidem retenti, qui ibi retenti et non evacuati corrumpunt locum, quem tangunt, vel ulcerant." And again towards the end: "Pustulæ virgæ fiunt, si quis coeat cum fœminâ habente ulcus in matrice, quæ contagio sitate suâ inficit virgam, et in eâ facit ulcus."

Petrus de Argelata, of Bologna, in 1470 (*Chirurg.* l. ii. tr. xxx. cap. 3. *De Pustulis, quæ adveniunt virgæ propter conversationem cum fœdâ muliere, quæ albæ sunt vel rubræ*) writes: "Ex materiâ venenosâ, quæ retinetur inter præputium et pellem virgæ causantur istæ pustulæ tales per hunc modum, quoniam ex retentione illius materiæ, quæ remanet inter pellem et præputium, ex actione viri cum fœdâ muliere, quæ non respirat putrefit; deinde ille locus denigratur et mortificatur substantia virgæ, quæ restaurationem non recipit, nisi corruptione illâ remotâ, et loco absterso." And then after prescribing certain detergent, styptic lotions, &c., for the cure of those pustules, he thus goes on: — "Unum recordor vobis, quod antequam ista balnea dicta (or lotions) ex vino illo styptico fiant, fiat purgatio, aliter illis bubo superveniret in inguine, quoniam materia quæ venit ad locum illum retropellitur à balneo isto (or rather lotion) et inveniens concavitatem inguinis illic moram facit; quare bubo generatur ad exituram pluries deveniet. Quare purgationem universalem facias; et imperiti medici sperantes indiscretè vel incautelâ non faciunt purgationem, quare duplici modo lucrantur, quoniam de virgâ et bubone. Iterum viri tales debentes materiam venientem ad locum resolvere, quærunt illud saniare ut aliquid lucrentur, et hoc non debet fieri à discreto homine et magistro."

That the above brief notices of ulcers on the penis and buboes in the groins refer to syphilis can hardly be credited, unless consecutive constitutional disease had also been described; but of this latter no evidence is furnished. However, it may be stated by the abettors of the non-mercurial treatment that these sores were actually venereal or syphilitic, no secondary symptoms appearing, owing to the strictly local and non-mercurial treatment adopted for their cure. Among the first writers who described the venereal disease, which appeared at Naples in 1494 or 5, and became epidemic over Italy, and rapidly spread throughout Europe, were Marcellus Cumanus, Nicolaus Leonicenus, and Coradinus Gelinus. Their works on this disease appeared in 1496 and 1497, and were followed by other productions in this latter year, in 1498 and in 1500, and in almost every successive year down to the middle of the 16th century. The writers were chiefly Italians, who describe the symptoms and treatment of the disease, assert it to have been an unknown malady previously to 1495, and speculate variously respecting its prevalence and rapid extension.

From these descriptions it is manifest that the distemper was virulently contagious; that it was communicated not only by sexual intercourse, ulcers appearing on the genitals, and followed rapidly by the most severe constitutional symptoms, &c., but also by contact of any part of the body of those infected, and by fomites, &c. Those who are desirous of becoming acquainted with the early history of this distemper — the most important chronic malady which infects the human frame — will consult with advantage the Collection of early treatises on Lues venerea, formed by Aloysius Luisinus, under the title, *Aphrodisiacus sive de Lue venerea, continens omnia quæcumque de hac re sunt ab omnibus Medicis conscripta*, 2 vols. in fol. Lugd. Bat. 1728. The dates of the first appearance of these treatises are, however, not always given by Lusinius. A *Supplement* to this work has been added in historical order by C. G. Gauner, entitled *Aphrodisiacus sive de Lue venerea: ejus* ledged by many who have visited the West Indies and inter-tropical America, that a syphilitic disease has prevailed from time immemorial in these islands and countries; and writers soon after the discovery of America mentioned the communication of it to the Spaniards, who carried it back with them to Europe. **Gruner** states that at first he was inclined to believe this to have been the source from which it had been introduced into Europe; but, upon further investigating the history of the distemper, he was induced to relinquish this opinion in favour of the one he has espoused; but as to the question now at issue, he does not furnish a satisfactory reply further than that it was said by a few writers that the malady had long previously been introduced amongst the Spanish Moors from Africa, or brought from Africa by them. Now there can be no doubt that a syphilitic malady very similar to, or a slight modification only of the syphilis of modern times, was an endemic or indigenous disease in Africa long before the expulsion of the Moors from Spain; and most probably for many ages previously; and it is very probable that the disease existing amongst both Moors and Jews, even to a slight extent, may have been developed into a most prevalent, pestilential, or epidemic condition by the circumstances connected with the emigration, and with the military invasion alluded to (§ 32.). I may refer the reader to what will be stated hereafter (§ 84. *et seq.*), respecting the diseases very closely related to syphilis, or *syphiloid affections*. There can be no doubt of these diseases having prevailed both in Africa and America long before the close of the fifteenth century; and admitting that they had been introduced into Europe by the followers of **Columbus**, they most probably had been brought into Spain by the Moors and Jews from Africa long before the discovery of America; and, existing among them, had been conveyed into Italy on their expulsion from Spain, shortly before the French invasion.

34. But admitting that *syphilitic diseases* (§ 32.) actually prevailed both in America and in Africa for ages before the discovery of **Columbus**, it does not follow that the disease brought by his followers from America was the cause of the epidemic syphilis of Italy and other countries in 1493, 4, and 5. Indeed this inference is completely disproved by facts; for, as **Sprengel** has contended, syphilis, according to the testimony of most reputable authors, had appeared early in 1493, and soon afterwards extended to most of Europe, whilst, according to **Oviedo**, the most credible of all witnesses on the subject, the fleet of **Gonsalvo**, which conveyed the Spanish soldiers to to Italy, arrived in Messina, on the 26th of May, 1495. Thus the disease was existing two years before the arrival of the Spaniards, and spreading in the army of Charles VIII. of France. That the disease existed in Barcelona in 1494 or 5, appears in a letter published by **Thiene**, from **Nicholaus Scyllatius**, a physician of Messina, the editor of an edition of the "*Rosa Anglica*," in 1492, and addressed to **Ambrosius Roxatus**, physician to the Duke of Milan. From

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vestigia in Veterum Auctorum monimentis, et quos A. Luisinus Omisit Scriptores, fol. Jenæ, 1789; and the following work, by the same author, will be perused with some interest: *De Morbo Gallico Scriptores Medici et Historici, partim inediti; accedunt Morbi Gallici Origines Maranicæ, Collegit, edidit, glossario et Indice Auxit.* 8vo. Jenæ, 1793. **Daniel Turner** published an abridgment of the folio volumes of A. **Luisinus**, under the following title: — *A Summary of the Ancient Writers on the Venereal Disease, extracted from his two Tomes, revised by* **Boerhaave**, *with Index of those omitted*. 8vo. Lond. 1736.

ii. As the *Identity of syphilis and gonorrhœa*, formerly contended for by some and denied by others, is now satisfactorily disproved, although in the present day most commonly resulting from impure sexual intercourse, it follows, that the evidence furnished respecting the period in which syphilis first appeared in Europe cannot be viewed as comprising also the time when gonorrhœa made its first appearance — or that the proofs as to the historical origination of the one could be extended to, or be considered as conclusive of, the same origination of the other, either as to time or to place. In the earlier histories, however, of cases of syphilis, gonorrhœa was often mentioned as a prominent symptom.

In the *Statutes*, which **Jane I.**, Queen of both the Sicilies, directed to be formed for the regulation of the public stews, established at Avignon in 1347, it is enacted (*Stat.* iv.) as follows:—"The Queen commands that, on every *Saturday* the women in the house be singly examined by the abbess and a surgeon appointed by the Directors, and if any of them has contracted any illness by their whoring, that they be separated from the rest, and not suffered to prostitute themselves, lest the youth who converse should catch their distempers."—This statute may be viewed as applicable to either venereal disease, or to neither; for it has been contended that sexual intercourse with a female during the catamenia, or suffering under leucorrhœa, with a leprous female, during the middle ages, or even in more recent times, when personal cleanliness was not so much attended to as now, would produce a sexual disease capable of propagation. That the malady which the above statute was intended to abate might have been gonorrhœal is not improbable, although no sufficient proof of its existence appears.

Mr. **Becket** (*Philosoph. Trans.* No. 357. ann. 1715) has endeavoured to prove that a venereal gonorrhœa was known in England some ages before 1494 under the names of *Ardor*, *Arsura*, *Incendium*, &c., and in English of *Brenning*, or *burning*, and described as an *inward heat* and *excoriation of the urethra*. This affection is treated of by **John of Gaddesden** in his *Pract. Med.* seu *Rosa Anglica*, in a chapter "*De Infectione ex Concubitæ cum leproso vel leprosa;*" and he there states: "Illum, qui concubuit cum muliere, cum quâ coivit leprosus, punturas intra carnem et corium, hoc est inter balanum et præputium, et aliquando calefactiones in toto corpore sentire." That this scalding might or might not arise from the cause here stated is equally probable, but it cannot be viewed as a proof of the existence of gonorrhœa, inasmuch as no mention is made of its coexistence with a copious muco-purulent discharge. That the time and the circumstances of the origination of gonorrhœa are not without some interest, will appear from the fact of this complaint being viewed by many recent writers as in no respect different from leucorrhœa, or blennorrhagia, according to modern nomenclature. In Africa, as I was able to learn from Moorish and other native physicians, gonorrhœa was viewed as a distinct disease, although often complicated with the yaws or syphilitic affections and with leprosy, and was viewed with syphilis, as possessing an antiquity as great as that of leprosy (see §§ 84, 85.).

Whether gonorrhœa made its first appearance in Europe at the close of the fifteenth century, or previously to this period, admits not now of satisfactory proof; nor even do we now know at what time it was first viewed as a variety of the venereal disease, or at least intimately connected with syphilis. **Astruc** remarks that all the physicians who lived in the close of the fifteenth and beginning of the sixteenth centuries were unanimous in their opinion that the venereal disease was a new distemper; but they entertained very different notions as to its origin.

The earliest writers believed the malady to have arisen from the influence of the stars, or certain conjunctions of the planets; others that it proceeded from the state of the seasons in connexion with fortuitous circumstances; some that it was an off-shoot of leprosy, or that it arose from the connexion of healthy with leprous persons; a few that it was the result of unnatural or unclean sexual intercourse, or of bestiality; and many that it was indigenous or endemic amongst the natives of Africa and America; but it does not appear to what they attributed the origin of the disease in these countries. (*See the Chapter on syphiloid diseases, or affections closely allied to syphilis.*)

this letter it appears that Scyllatius was in Barcelona in 1494, that the distemper was spreading among all ranks, and was propagated by contact only, and that it was universally believed to have proceeded from Provence, where it was named the disease of St. Ment. Scyllatius thought it the *sahafathi* of Avicenna; but while he describes its general characters, he says nothing, as may be expected from the date of his letter, of an American origin.

34.* It is difficult if not impossible to determine accurately either the place or the date of the first appearance of syphilis in Europe. So rapidly did it manifest itself in one place after another, that it is impossible to determine the place in which it was first recognised. Fulgosus states that it appeared in Italy as early as 1492; Petronius, C. Torella, Haechard, Ulrich de Hutten, and Borgarutius, in 1493; John de Vigo, Massa, Cateneus, Hock, Schmauss, Fallopius, and many others, in 1494; Brasavolus, in 1495; Phrisius, Montesaurus, Mainard, Benivenius, and Montanus in 1496; and Fracastorius as early as 1490. It should not be overlooked that these and other authors evidently assigned these dates as the times when the disease became known to them, or in the places where they wrote, or they took the dates from the testimony of others. Wherever or whenever it first appeared, it cannot be disputed that it was speedily evinced in the chief cities of Europe. That it was seen as early as 1490, according to Fracastorius, or 1492, as stated by Fulgosus, may be inferred from the circumstance of its having been mentioned, in the Mansfield Chronicle, in the Leising Chronicle, the Leipsic Annals, and the Zweifalt Annals, as being general in Germany in the summer of 1493; "and it is even said to have prevailed at least four years in Misnia. It was common in Auvergne in 1493. It was known in Paris in 1494, and in Augsburg in 1495." It appeared in Memmingen, at Nurnberg, and in Edinburgh in 1496; and it spread through Bohemia in 1499. It has been considered remarkable that the Chronicles of Barcelona, Valencia, Murcia, Toledo, Seville, Burgos, Guadalaxara, Valladolid, Segovia, and other cities in Spain, have made no mention of the period at which the disease first appeared, and the same is true of the contemporaneous annals of Portugal. The opinion which I have expressed (§ 112.), that this distemper is identical with the African Yaws, which is indigenous among the negro races, that it spread to the Moors and Jews in Northern Africa, and was thence conveyed by them into Spain and Portugal ages before it spread into France and Italy, and there became epidemic, will account for the first appearance of the distemper in the cities of the Iberian peninsula not having been mentioned, inasmuch as it had become there a well-known malady for ages before the end of the 15th century.

35. ii. Description of Primary Syphilitic Ulcers. — These, usually termed *chancres*, are caused by the application of the syphilitic virus, to any part—mucous or cutaneous; to the former when entire or otherwise, to the latter also when entire, but much more readily when wounded or abraded. Their common *seat* is the genitals; in men, most frequently on the inner surface of the prepuce, or between the prepuce and corona glandis, and especially in the angle by the side of the frænum. "The *time* at which venereal sores appear, is said to be from the third to the tenth day after infection; but it is more probable, as Ricord observes, that the syphilitic virus operates progressively from the first moment of its application, but that the ulcer is fully formed by the fifth day, although it may not be perceived till later" (Druitt). The average *duration* of a syphilitic ulcer produced by inoculation is, according to Wallace, twenty-five days.

36. Primary syphilitic ulcers present several varieties, which have been arranged by Mr. Henry Lee under the following heads: — 1st, The indurated or Hunterian chancre — a slow, torpid ulcer, encircled by adhesive inflammation; — 2d, The non-indurated, or pustulous, ulcer, marked by early and free suppuration: — 3d, The phagedænic or ulcerative; — and 4th, The sloughing; — 5th, To these I may add, Urethral chancre.

37. 1st, *The indurated or Hunterian chancre* "is generally found on the common integument, or on the glans penis. It may begin either as a pimple, or as a patch of excoriation which heals up, leaving the centre ulcerous." When this ulcer is produced by inoculation, in order to observe accurately its progress, M. Ricord states, that the puncture reddens during the first twenty-four hours; that in the second and third days it swells slightly, and becomes a pimple, surrounded by a red areola; from the third to the fourth day the cuticle is raised into a vesicle by a turbid fluid, with a black spot on its summit caused by the dried blood of the puncture; from the fourth to the fifth day, the morbid fluid increases, and becomes purulent, the vesicle becoming a pustule with a depressed summit. The areola, which had increased, now begins to fade; but the subjacent tissue becomes infiltrated and hardened with lymph." After the sixth day, "if the cuticle and the dried pus which adheres to it be removed, there is found an ulcer, resting on a hardened base; its depth equal to the whole thickness of the true skin, its edges seeming as if cleanly cut out by a punch—its surface covered with a greyish pultaceous matter, and its margin hard, elevated, and of a reddish-brown or violet colour. The ulcer feels to the finger like a little cup of cartilage set in the flesh."

38. 2d. *The suppurating or non-indurated chancre* has been divided into four stages. It is *first* a small itching *pimple or pustule*, and displays when it bursts, *secondly*, a foul *yellowish* or *tawny sore*, with slight swelling and redness, and spreading circularly; it may or may not be covered at first with a dirty brown scab. "In the third stage it throws out indolent fungous granulations (and in this stage is sometimes called the *raised ulcer* of the prepuce), and is usually stationary for a little time, after it has ceased to ulcerate and before it begins to heal. In the *fourth* stage it slowly heals; cicatrisation being preceded by a narrow vascular line. If the ulcer be seated near the frænum it is sure to perforate it."

39. 3dly. *Phagedænic chancres* are very painful and rapid in their progress. Their surface is yellow and dotted with red streaks; their shape irregular, their edges undermined or irregular, and the discharge from them profuse, thin and sanious. The surrounding margin usually appears puffy or

œdematous, generally presenting a low grade of vitality, but sometimes it is firm, and vividly red. These ulcers occasionally eat deeply into the substance of the penis, or undermine the skin extensively; but they generally spread much more widely than deeply, and hence they have been called serpiginous. Sometimes these sores are more irritable than phagedænic, being acutely painful, discharging a thin ichor, having a raised surface of yellowish exudation, but not spreading much although obstinately refusing to heal.

40. 4th. *Sloughing chancres* are most frequently observed in the prepuce and integuments. Other chancres, however, presenting the simple states of inflammation observed in the second variety, may be changed into a gangrenous or sloughing state by local irritation, excessive horse-exercise, by excessive debauchery, intoxication, or whatever depresses or exhausts vital force.

41. 5th. *Urethral chancre.* — The secondary syphilitic symptoms which were formerly attributed to gonorrhœa have been satisfactorily proved by Ricord, but very long believed to proceed from a chancre in the urethra, and the distinct natures of the two venereal diseases thereby determined. The existence of chancre in the urethra may be inferred, if, with many of the symptoms of gonorrhœa, the discharge varies much, sometimes being thin, scanty, and bloody, sometimes thick and profuse; and if there be one painful and indurated spot, not far from the opening of the urethra. But the existence of urethral chancre can be certainly proved only by the ulcer being visible at the orifice, or by inoculation with the matter.

42. Syphilitic Ulcers in the Female may assume the several states described above. They do not commonly cause so much distress as in the male, although there are many exceptions to this rule; but they are always slow in healing, especially when the urine passes over or comes in contact with them. When they are seated high in the vagina, the symptoms produced by them are very equivocal, the discharge not materially differing from that attending other lesions; an examination by the finger or by the speculum being requisite.

43. iii. The Diagnosis of primary Syphilis. — Various affections, described under their appropriate heads, may be mistaken for chancre. These are, 1st. *Gonorrhœa externa*, or *balanitis*, consisting of inflammation of the glans and inside of the prepuce, with profuse purulent discharge and excoriation of the cuticle. It may proceed from gonorrhœal infection, or from neglect of cleanliness, and the acrid secretions of the part, or the unhealthy secretions of the female, especially in a person with a long prepuce; 2d. *minute aphthous-looking points* surrounding the glans; 3d. *Herpes preputialis*; 4th. *Psoriasis præputii*; 5th. *Chronic eczema*, which, however, rarely affects the genitals, unless it be present in other parts; 6th. *Simple excoriations*, from friction or other non-specific causes.

44. It must, however, be admitted, that the characters of primary syphilitic affections are not sufficient to enable us to distinguish them with certainty from the above or similar affections arising from ordinary causes; and that the several varieties of primary syphilis now described afford us no sure grounds for practical distinctions between each other. The only circumstance in which all writers, from Astruc to the present day, agree, is that ulcers of an obstinate nature, attended or followed by induration, are those most likely to be followed by constitutional disease. That the indurated chancre alone is characteristic of genuine syphilis, according to Hunter, Carmichael, and Evans, cannot now be credited, and would confine syphilis within very narrow primary limits; for the genuine Hunterian chancre is now extremely rare. Nevertheless Mr. Henry Lee and Dr. Druitt, although they divide primary syphilitic ulcers into four varieties (§ 36.), state that it seems almost certain that it is only after the *Hunterian variety* that constitutional symptoms are to be dreaded, or preventive treatment required; and that sores of the suppurative, ulcerative, and sloughing varieties, and those attended by suppurating bubo, do not, as a general rule, affect the constitution.

45. On this fundamental subject, Dr. Colles, a most experienced and enlightened surgeon, makes the following remarks: "Although every surgeon must admit that Mr. Hunter's description of a chancre is correct, and drawn from nature, still, I believe few will confine this term, or that of primary venereal sore, to those ulcers only which answer to this description. As the result of long, attentive, and anxious observation, I should say that primary venereal ulcers present an almost endless variety of character. I would define a primary venereal ulcer to be one which is remarkably slow in yielding to ordinray, mild, local treatment; but which is curable by mercury, and which, if not so cured, is likely to be followed, in two or three months, by secondary symptoms, which again are also curable by mercury. If, then, there be, as I affirm there is, an almost endless variety in chancres, how can we decide on the nature of primary ulcers, so as to pronounce some to be syphilitic, and others to be mere common sores, or simple excoriations? I reply, that we are to be guided in our decision by observing, first, that many of these suspicious ulcerations cannot be referred to any class of common ulcers, as they strikingly differ from them; and, secondly, by attending to the course which these take, when not interfered with by any stimulant or caustic application, and when treated only with some mild ointment or cold water. If, under these circumstances, we find that, after eight or ten days, such ulcers show no disposition to heal, and if at the same time there be a total absence of any cause, such as defect in the general health, to account for this obstinate condition of the local disease, we may then pronounce them to be syphilitic." (*Op. cit.* p. 75.)

46. *The constitutional effects* of syphilitic infection are even still more variable and uncertain in their characters than the primary. It is manifest that *bubo* has been considered by many, and more especially by M. Boyer, of too great importance, for it is certainly not a diagnostic of genuine syphilis, nor is it a secondary symptom, but merely a local consequence of the primary sore, — the effect of irritation, or of the virus conveyed, to the inguinal glands, by the absorbents from the local sore, no constitutional affection often supervening when it suppurates freely. When a patient has a syphilitic sore, which has not been destroyed within five days, he is liable

afterwards to these effects which will hereafter be described as *secondary* and *tertiary syphilis*. Yet, according to Mr. Henry Lee and Dr. Druitt, it seems almost certain that it is chiefly after the Hunterian variety that these effects are to be dreaded, and their preventive treatment is required; and that the suppurative, ulcerative, and sloughing varieties, and those attended with suppurating buboes, do not, as a general rule, inflict secondary disease. A developed Hunterian chancre, or its cicatrix if hard or red, like the vaccine vesicle, affects the constitution, "so that if it be cut out or destroyed, the wound will assume the same character, and require the same constitutional treatment, as if the malady had not been interfered with." It has also been recently shown that repeated syphilitic infection begets a protection against fresh attacks; and that the production of additional suppurating syphilitic sores not only does not confer any fresh liability to secondary symptoms, but seems to diminish that which exists already. Hence it has been proposed, as will be shown in the sequel, to inoculate syphilitic and other persons with syphilitic matter, or to *syphilize them*—in order to prevent and to cure this distemper—a subject which will be noticed in the sequel.

47. *The marked differences presented by the primary sores and the secondary symptoms of syphilis*, not only soon after the epidemic appearance of the distemper in Europe, but also during its subsequent prevalence, and in modern times, have been variously explained. Mr. Carmichael believed, that there were several distinct species of venereal poisons, each of which produced a specific primary sore and a specific train of secondary symptoms; that the Hunterian chancre, for example, was followed by an excavated ulcer of the tonsils, scaly eruptions on the skin, nodes, &c. But the history of the malady, the diversified symptoms which result from either form of primary sore, and various other considerations warrant a belief only in one specific virus or poison, which manifests itself both primarily and constitutionally in varied forms, according to the circumstances of infection—to the intensity of the primary morbid action, to the tissue with which the virus is brought in contact, and to the temperament, habit of body, diathesis, and suceptibility of the person infected. Hence arise different modifications or even varieties of the distemper—all resulting from one specific morbid poison. Thus they pass into each other in every phase or grade, without being originally or specifically distinct; and hence the one form or variety may prevail in different countries and races, and even in different ages, and under different influences, and yet give rise to another variety either as to form or intensity, when it infects different races, diatheses, and constitutions. Even in the same country and race, the circumstances and habits of the infected, especially mental and physical distress, prolonged fatigue and exhaustion, debauchery, frequent excesses and intoxication, neglect of cleanliness, &c., will occasion a much more intense and intractable disease, than in persons differently circumstanced. It was most probably owing to these influences that the disease was so severe even in its primary symptoms amongst our troops during the campaigns in Portugal and Spain, and so mild among the natives. Owing probably to the differences in race, it presented to my own observation in Africa, different modifications or forms and grades of intensity among the negroes, from those more usually observed in the white races. As to this topic, however, I would suggest a further, and more precise and extended observation, than I was enabled to make. There can be no doubt that in this country various forms of constitutional affection may proceed from the same kind of primary sore.

47*. III. Syphilitic Bubo.—Inflamed and enlarged lymphatic glands, consequent upon a venereal ulcer, arise from the virus contained in, or secreted by this ulcer or chancre. This affection of the inguinal glands may arise from the irritation of, or absorption from, gonorrhœal inflammation of the urethra; but it is not so frequent, nor so severe as when it is caused by chancre. Syphilitic bubo cannot be viewed as an indication of the existence, or even of the commencement of, the secondary or constitutional disease; for the affection of the glands may even, according to the more recent occurrences of the disease, be the means of preventing the constitutional contamination. This, however, was not the case in the earlier histories of the distemper, and more especially after the epidemic prevalences of the disease in the end of the 15th, and during the 16th century.—*a.* The *forms* and *diagnosis* of bubo have been correctly and succinctly given as follows by Dr. Druitt:—1st. *Bubo of the penis* is an inflammation of a lymphatic in the penis, which may be felt like a cord under the integuments, and which passes into abscess in some part of its course. 2d. *Acute bubo* in the groin generally affects one gland, and pursues the course of an acute abscess. The cellular tissue surrounding the gland is the usual seat of suppuration, but there may be also a small abscess in the centre of the gland, caused by the transmission of the poisonous matter, and the pus of this latter is alone capable of producing a chancre by inoculation. 3d. *Chronic or indolent bubo* commonly affects more than one gland. It occurs in weak or scrofulous habits, and especially in persons injured by the improper use of mercury. The glands enlarge slowly, suppuration is protracted and imperfect, and commences at several points. The skin is long in inflaming, and on becoming so, a large tract assumes a dusky bluish tint; the matter extends, and at last large portions of skin perish by ulceration, leaving an extensive sore, that may be months in healing.

48. *b. The diagnosis of syphilitic bubo* requires attention. If one gland only, and that above Poupart's ligament, be affected, it is most probably caused by chancre on the penis, provided there be, or has been one. "But if many glands are swollen, and they are below the level of Poupart's ligament, the swelling is probably caused by some irritation about the foot (or extremity). But the only sure diagnosis of a syphilitic bubo is that, if the matter taken from it be inoculated, it will produce a chancre; or that the sore produced by opening the bubo presents the elevated edges and copper-coloured margin of a chancre." As every bubo is attended by suppuration of the surrounding cellular tissue, the matter taken when first opened may not cause chancre by inoculation. There is no certain proof of a bubo being syphili-

tic unless preceded by chancre, unless a chancre can be produced by inoculation of the discharge, or unless decided secondary symptoms supervene.

49. IV. Secondary Syphilis. — Constitutional syphilis may occur from a fortnight to three or four months after the primary symptoms. The usual time is five or six or seven weeks. Early in the history of syphilis in Europe, the constitutional affection was much more early than the shortest time now named, and was not infrequently the first produced owing to the readiness with which the contagious principle was imparted and imbibed. Before the appearance of secondary symptoms, the constitution betrays its infection by a variety of *premonitory symptoms*,—by a dispirited and even wan expression, by want of appetite and sleep; by heaviness of the eyes, rheumatic pains, especially during the night, and pallor and loss of flesh; and lastly, by a slight eruptive fever usually of an inflammatory type. Upon these, after a short but variable period, the secondary symptoms supervene, sore throat generally accompanying this fever or soon following it.

50. *The symptoms premonitory* of the secondary or constitutional disease are sufficient evidence of the infection of the body by the primary disease, although those alterations usually termed secondary are not yet developed. The dull, earthy hue of the surface, the loss of bodily and mental vigour; the dryness of the hair, and loss of its smoothness and glossiness, and the giddiness, headache, uneasiness about the neck, or supra-orbital pain, usually on one side, and when the body is recumbent, are amongst the earliest indications of this infection. On these supervene pains about the joints; lassitude of the limbs; enlargement of the posterior cervical glands; loss of the tone, fulness and strength of the pulse; more or less anæmia, and falling out of the hair. The loss of hair indicates an inveterate form of disease, and is often attributed by patients to the use of mercury; but this mineral will not cause *alopecia*, but syphilis will. These symptoms, although not generally recognised as secondary, but they are so nevertheless, and if not arrested by treatment, will soon be followed by those which are more generally described as such.

51. i. Syphilitic Eruptions. — *The secondary effects of syphilis* are ultimately developed either on the skin or mucous membrane, especially of the throat, or on both. *A.* The earliest of these to appear is an *exanthematous* or *erythematous eruption*, which may be either attended by fever, as stated above (§ 49.), or entirely independent of fever. This eruption may occur either during the existence of the primary symptoms, or a few weeks after their disappearance. It sometimes assumes the appearance of either measles or scarlatina, and at its commencement is usually of a rose-colour, the surrounding skin being of an unhealthy or dusky hue. The redness disappears on pressure, but returns immediately when pressure is removed. The surface of the body may be covered at once, but more frequently in succession, by this eruption, which soon loses its rosy hue, and daily becomes more and more dusky, until it assumes a coppery and more permanent tint. It is generally unattended by either heat or itching. It generally fades away for a while, and then reappears; and it may thus proceed, with interruptions, for two, six, or twelve months, but after a year or two it entirely dies away. In half the cases the eruption remains unnoticed, and it very often fades away without the patient being aware that it ever had any existence; but some time after another and a deeper eruption makes its appearance. This state of the eruption may be mistaken for pityriasis, or this latter for syphilis; but the history of the case, the appearance of the eruption, the absence of itching, and the impaired health of the patient, will indicate its syphilitic nature.

52. *B.* A more developed form of syphilitic eruption may appear as *papulæ*, of various sizes, or as *psoriasis*, in which the skin is raised in copper-coloured blotches, covered by *scales* of hypertrophied cuticle. These eruptions are succeeded merely by exfoliations of the cuticle or thin superficial scabs. An aggravated state of the foregoing begins with an eruption of copper-coloured blotches, which become covered with *scales* of enlarged cuticle, and form *syphilitic lepra*. These scales are succeeded by thin scabs, and these, on falling off, leave shallow ulcers with copper-coloured edges.

53. *C. Vesicular eruptions*, often assuming the form of *rupia*, may occur, appearing at first as large flattened bullæ, filled with serum, passing into a purulent state, and finally drying into thick scabs, under which the skin is ulcerated. The ulcers spread under the scabs, and, owing to the successive additions of the dried matter as they extend, they become remarkably thick, conical, and resemble limpet shells. The eruption may be distinctly *pustular*, constituting *syphilitic ecthyma*, the pustules being large and prominent, leading to ulcers, with a copper-coloured base.

54. *D. Tubercular eruptions*, broad, reddish, or copper-coloured, appear on the face, most frequently at the alæ of the nose, or on the cheeks. They suppurate slowly, and are succeeded by deep irregular ulcers, terminating in puckered cicatrices. This eruption, in Dr. Druitt's opinion, more properly belongs to the class of tertiary symptoms, in which mercury is almost inadmissible. This eruption usually appears a very considerable time from the primary symptoms in persons of weak constitution, or who have been broken down by privation, dissipation, or unavailing courses of mercury; it is consequently an unfavourable form of the disease. "A patch of this kind of unhealthy inflammation is apt to form on the tongue, and after a time an abscess breaks, disclosing a ragged excavation, filled with orange-coloured sloughs, and exuding a copious fœtid discharge. If it occur on the palate, a probe will detect bare exfoliated bone, which rapidly perishes, and leaves a hideous chasm."

55. *E. Mucous Tubercles, Condylomata*, — *Tubercule muqueux, Pustule Plate*, consist of raised patches of skin, with a red and moist surface, like mucous membrane. They exude a thin, acrid, and offensive discharge. They are most frequently situated in the vicinity of the genitals, or in any other place where two surfaces of skin come in contact, presenting an excoriated appearance. They constitute a peculiar syphilitic eruption, and are undoubtedly capable of producing constitutional syphilis, generally with a similar eruption, in healthy persons. Indeed

such a result may follow the tubercular or even the pustular forms of secondary syphilis in certain favourable circumstances. (*The several forms of syphilitic eruption are more fully described in the several articles devoted to diseases of the skin.*)

56. Venereal eruptions are not severally characteristic of any distinct form of syphilis, primary or constitutional. Dr. Colles states, — 1st. that he has not been able to trace back particular forms of eruption, to particular forms of primary ulcer. 2d. He has not unfrequently observed varieties of eruption existing together in the same person. 3d. After the removal of the first eruption by mercury or other means, the second crop will often prove of a different kind; and 4th. any form of eruption may be converted, by injudicious treatment, as the excessive use of mercury in bad habits, into one which is most obstinate and severe. This opinion agrees with those of Hennen, Oesterlan, S. Cooper, Bacot, and others. Mr. Babington considers the variety of venereal eruptions to be so great as to baffle description. He, however, arranges the more distinct forms under the heads of *Tubercles*, *Lichens*, *Psoriasis* and *Lepra*, and *Rupia*. The most important practical point, which many writers connect with these distinctions into form of eruption, is, that rupia and ecthyma are met with in a very dangerous general depression of health, requiring the greatest care.

57. *F. The diagnosis of secondary eruptions* is of great importance — is sometimes very easy, and occasionally very difficult. In all cases the previous history of the patient should be inquired into. It is not only necessary to ascertain whether or no a chancre has existed, but also the time when it occurred, its situation, and its character. If no chancre, but gonorrhœa only, in male or female, preceded the eruptions, it should be recollected that chancre may have escaped the patient's notice, or may have existed in the urethra of the male, or in the vagina or cervix uteri. In these cases, caution and further observation are required. If sores are admitted, their characters, especially as regards induration, are of importance.[*] A knowledge, likewise, of the existence of suppurating bubo may be useful, for indurated chancre is rarely attended by suppurating swelling in the groin; and lastly, the existence of any traces of indurated chancre or bubo ought to be ascertained, the denial of the patient not being sufficient.

58. As respects the eruption, M. Ricord remarks that one of the most important characters of it is a total absence of pruritus, whereas itching is a very frequent symptom of the other kinds of eruption. When, however, the syphilitic eruption affects naturally pruriginous regions, as the anus, the genito-crural fold, there may be considerable itching owing to the irritating nature of the secretion. Syphilitic eruptions are generally apyretic and indolent, involving in a short time the whole body, generally by successive instalments. They spread indiscriminately to all parts, and do not affect the face in preference to other parts. They emit no smell, unless there be an exudation of fluid or suppuration. "There is nothing specific in the smell, nor in the colour mentioned by Swediaur, nor the ham-like hue spoken of by Fallopius, which latter has been, with reason, looked upon as an important sign, and an absolute and constant character." Secondary eruptions generally present rounded and well-defined patches, the colour of which may be more or less deep in their centres. They have very little tendency to suppuration; and when matter does form, it is generally small in quantity, and unhealthy in character. The eruptions which do not suppurate, generally disappear in time by resolution or desquamation. The scales in these cases are less brilliant and thinner, dry more quickly, and more frequently furfuraceous than in non-specific affections, and the scales sometimes fall off in large shell-like pieces. The crusts sometimes accumulate in successive layers as in rupia. When, by the falling of the crust, the ulceration underneath becomes apparent, it generally is rounded, its fundus greyish and pultaceous, is surrounded by a darkish areola, with a certain induration in the margins. Phagedena of these ulcerations is rare; but when it does happen, it sometimes extends rapidly. Secondary syphilitic ulcers are preceded either by some eruption, as ecthyma, rupia, papulæ, or tubercles; they rarely follow vesicles or psydraceous pustules. Ricord agrees with Hunter in considering the diagnosis of secondary symptoms as most difficult; for "there is hardly any disorder that has more diseases resembling it in all its forms than the venereal disease."

59. *G. Secondary affection* of the scalp — *Alopecia syphilitica* — is amongst the earliest constitutional disorders consequent upon syphilis. It commences with slight itching, tenderness or soreness of the scalp, attended by rheumatic pains. On examination, no trace of eruption can be detected; but if the patient have suffered within four or eight weeks, from chancre, or if any induration remain in its situation, the tenderness of the scalp will soon be followed by the loss of hair and some one of the affections of the skin, throat, &c. The alopecia commences very gradually. The hair at first becomes dry and crisp, loses its glossy appearance, breaks readily, a brush or comb causing great pain. The hair is often seen broken off close to the scalp, and patches of baldness, or approaching to it, are found here and there. At a more advanced stage the hair comes away with the bulbs in considerable quantity. Pityriasis now becomes troublesome; and various points of the scalp assume a

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[*] Dr. M'Carthy says, "In 123 cases of secondary symptoms, indurated chancre had preceded the eruptions 118 times, and been recognised in the hospital, or the patient recollected having felt it. In one case only the patient could recollect that a clap only had preceded the condylomata which we observed on the patient; but this clap was attended, he told us, with a bloody discharge, which occurred seven months previous to his admission into hospital. In 4 cases we were unable to obtain accurate recollections on the subject of induration.

"The examination of these 123 cases clearly proved to us, in consequence of the frequent unexpected situation of the primary sore, the reason why we daily meet with cases which give reason to suppose that secondary symptoms may arise spontaneously. In 6 cases the sore was seated in the urethra, when inoculation enabled us to recognise it three times; in the other cases, the disease, at first concealed from view, ultimately appeared as a urethral chancre at the meatus. Four times at the anus; once in the nostril; once on the chin; once on the lip. Suppose we take these 123 patients, and compare those primary symptoms, for the purpose of attempting to discover some one character which appears sufficiently often to enable us to draw a deduction from it, we find that in *one and all* the inguinal glands have been observed enlarged, but suppuration took place only *twice*, and in these the buboes had a scrofulous appearance, and it was not possible by inoculation to obtain the specific pustule." (*Note from* Acton's *op. cit.*, p. 488.)

rosy hue; the rest of the skin generally having a yellowish, unhealthy appearance. Slight febrile symptoms set in, attended often with rose-coloured spots on the abdomen. The patient now frequently complains of rheumatic pains in the joints, with loss of appetite and debility. The loss of hair requires immediate attention, especially when caused by syphilis, as it may be very considerable in a short time, and its growth very uncertain. It should, however, be remarked that if the hair does not fall out at the commencement, it is not very frequently lost in the latter stages of constitutional syphilis.

60. At a more advanced stage, a papular affection of the scalp, commencing with little rose-coloured elevations, attended by itching, is observed. These papulæ, or *lichens*, increase in number, slight pearly-white scales form on their apices, which fall away and are replaced by others. The hair is scurfy, and the papulæ or elevations, at first the size of millet seeds, become large and assume the form of *lepra* or *psoriasis*. When the scales are removed, the skin looks like a recently-blistered surface, and exudes a small quantity of thin pellucid fluid; or it is quite dry. In particular situations, especially behind the ears, in the folds of the neck of stout persons, or those inattentive to cleanliness, those places instead of becoming scaly remain moist, the oozing from them excoriating the surrounding parts, and developing mucous tubercle or condyloma. As the disease of the scalp advances the papulæ or lichen pass into an impetiginous or an eczematous state. In still more advanced stages, ulcerations of a very intractable character, forming tertiary symptoms, form in the spots of impetigo or eczema; and tumours as large as horse-beans form in the scalp, at first unattended by pain or redness. Fluctuation may be detected in them after some time, and when punctured a thin, serous, straw-coloured fluid exudes. If left alone they become painful and red, ulcerate, exposure of the bone ultimately following, and even necrosis, which are now chiefly seen in pathological collections, and but rarely in practice in the present day.

61. *H. Syphilitic Onychia.*—The venereal affections of the skin or scalp may be extended to the nails. In these cases the matrix suffers, and the nail grows thick and nodulated, closely resembling the changes which take place in it from inveterate psoriasis. There is a great similarity between onychia and alopecia. They both depend upon the constitutional infection interfering with the formation or nutrition of these cuticular appendages.

62. ii. Syphilitic Affections of Mucous Surfaces.—*A. Syphilitic Affections of the Throat.* —*a.* The *mildest affection* of this kind is a superficial excoriation of the mucous membrane, most frequently of the tonsils, but not unfrequently also of some other parts of the fauces or mouth, corresponding to psoriasis on the skin. The affected parts are slightly swollen and sore, afterwards red and raw, or covered with a whitish exudation, or with a patch of thickened epithelium. If the disease proceed it will generally be followed by superficial ulceration.

63. *b.* An *excavated ulcer* may follow the foregoing, or may be first to come before the physician, although it may have been a consecutive lesion of the parts. This ulcer appears as if a piece had been scooped out of the tonsil. Its surface is foul or yellow, its edges raised and ragged, and swollen. It occasions much less inconvenience than its appearance might indicate; and there is very little constitutional disturbance from it, unless it be attended by eruption. As the lesion advances, or swelling increases, the patient's speech becomes guttural, and he often complains of pain shooting to the ears, and of partial deafness.

64. *c. Sloughing ulcer* begins as a small *aphthous* spot which rapidly ulcerates, and is attended with great pain and fever. "The surface of the ulcer is covered with an ashy slough, and the surrounding membrane is dark, livid, and swollen. The lingual artery may be opened by the spread of the ulceration, and the patient may die of hæmorrhage, unless the common carotid is tied." (Druitt, p. 187.) In some instances, especially when mercury has been given in large quantities for primary symptoms, the affection of the throat comes on notwithstanding, and assumes a red and sloughy appearance; a piece of the tonsil appears as if punched out, and the ulcers rapidly extend in size and depth.

65. The *situation* of the ulcerations, most frequently of the excavated, is commonly on the tonsils, on the sides of the tongue, on the upper surface, er on the under surface close to the frænum. Sometimes they are met with on the dorsum of the tongue, here assuming an elevated character, like the condylomata around the anus. They occasionally attack the palate, pharynx, and more rarely, in the posterior and lower part of the pharynx, in which latter situation it occurred in a patient many years ago under my care, ulceration also having extended to the larynx and terminated fatally. Ulcers also form at the corners of the mouth, where they may form scabs, or are liable to bleed, when the mouth is fully opened.

66. *B. Syphilitic ulcerations of the nose and palate* commence with inflammation and ulceration of the mucous membrane covering the parts, similar to those of the throat. The ulcerations may proceed until they denude the periosteum, and afterwards produce exfoliation of the bones and profuse fœtid discharge, and ultimately very marked deformity. Ulceration of the nose generally begins with ozæna, or with a sense of pain, heat, dryness, and snuffling. But the bones of the nose may become otherwise attacked, as shown in the sequel (§ 75.).

67. *C. Syphilitic ulceration of the larynx* is chiefly a consequence of the extension of ulceration from the palate or pharynx. It is characterised by tenderness, slight pain or uneasiness referred to the larynx, by huskiness of voice, followed by a low whispering, or loss of voice; by suffocative cough, and by expectoration of a sanguineo-puriform matter. There is great loss of strength and flesh; and life is often terminated by suffocation.

68 *D. Secondary affections of the eyelids and eyes.*—Not only may inflammation of the eye be consequent upon *gonorrhœa* (see art. Eyes, *gonorrhœal inflammations of*, § 56. *et seq.*), but eruptions and affections of the eye-lids and of the eyes themselves, chiefly in the form of iritis, may appear in the course of secondary or constitutional syphilis. These eruptions often appear on the external surface and on the ciliary margins of the

lids. In some instances, the corners of the eyelids have a cracked, scaly appearance, resembling a similar alteration more frequently occurring at the angles of the mouth, and, as in this latter state, the eruption is connected with syphilitic affections of either the skin or of the mucous membrane, of the throat, &c., or of both; and it may appear in any period of the progress of these affections. In some cases, the conjunctiva is also either partially or extensively implicated. *Syphilitic iritis* is not unfrequent; and is fully considered in the article *on the diseases of the* Eye (§ 132. *et seq.*), to which I must refer the reader.

69. iii. Tertiary Syphilitic Diseases. — Certain constitutional effects of syphilis, which more frequently are consecutive of several of those already mentioned, than associated with them, — although such associations, especially in the advanced course of the latter is often observed — have been classed as *tertiary symptoms* of the disease. They may, however, occur after the removal of the secondary forms of the distemper, or independently of these, and at a remote period from the primary symptoms. Under the term *tertiary symptoms* have been arranged *nodes, inflammation of the periosteum, exostosis, caries of the bones, tubercles of the sub-cutaneous and submucous tissues, disease of the testes* consequent upon primary or secondary syphilitic disease. These affections were generally classed with those secondary symptoms already noticed. John Hunter first distinguished them by designating them the "*Symptoms of the second period of constitutional syphilis,*" a designation which many will agree with me in considering as more appropriate than that imposed on them by M. Ricord.

70. Though *tertiary symptoms* generally depend upon chancre, or, in rare cases, upon infection by a secondary disease, they follow the primary symptoms after a much longer interval, and they are seated in other and more deeply-seated structures than the secondary. They affect chiefly the sub-mucous and sub-cutaneous cellular tissue; the structure of the bones; the fibrous structures, especially the periosteum; the joints; the testes, and lymphatic system. The syphilitic poison may even develope disease of the liver, lungs, brain, and heart. Tertiary affections cannot be transmitted from parent to child — are not hereditary; but they are undoubtedly capable of producing a scrofulous diathesis in the offspring.

71. *A. Course.* — In the more usual course of the disease, tertiary symptoms do not supervene until six, seven, or nine months from the primary, and in some they may be delayed for several, or even as many years. Although these symptoms may be separated with propriety from the secondary, yet it will very frequently be difficult to draw the line of demarcation between them. They may be both so associated, or the one class may pass so insensibly into the other as not to admit of an inference as to the predominance of the one set of symptoms over the other. In the natural course of syphilis the tertiary form very frequently thus appears during the existence of the secondary, in the same way as the latter may come on during that of the primary. Under other circumstances, as from treatment, careful regimen, &c., the secondary symptoms may have successfully disappeared and returned, and ultimately the tertiary have supervened; and even, although in rare instances, an indurated chancre may have existed, and been apparently cured, yet, after a very considerable lapse of time, tertiary symptoms may appear generally from the influence of causes hereafter to be noticed (§ 109. *et seq.*), at first in a slight form, but with increasing severity, notwithstanding the non-existence of secondary symptoms between the primary and tertiary. During the course of tertiary affections, various *complications* may be developed, not only by the syphilitic poison, but also aided by treatment, by pre-existing tendency to visceral or other diseases; by the causes, influences, and circumstances to which the patient may have been exposed, and by climate, race, occupation, &c.

72. *B. Syphilitic affections of the testes* are generally amongst the earliest of tertiary symptoms to appear, and may occur during the existence of the secondary. They may, however, supervene in five or six months, or not until as many years, from the primary infection. They may appear either alone, or attended by pains in the bones, exostoses or gummata; but they are of rare occurrence in the present state of the distemper. Astruc first, and Hunter, Sir A. Cooper and Dupuytren, subsequently, made the distinction between diseased testicle consequent upon syphilis and that following gonorrhœa. Syphilitic disease of the testes may commence in one and extend to both, or it may begin in both at once. Excepting slight nocturnal pains in the loins in some cases, the affection often reaches a considerable height before it is noticed. When the patient's attention is attracted by it, the testes are found heavy, hard, and generally much increased in size, although not always. The disease may run its course without much uneasiness, and hence be neglected, and organic lesions may supervene which cannot be removed. The erections, however, and the venereal desire become, on the full development of the disease, less frequent, and the seminal discharge is diminished. If the disease continue, or be neglected, the testes decrease in size, and ultimately may become atrophied and may even disappear nearly or altogether. These changes are extremely slow, and may continue for several months or even years before the organs are entirely lost. A full description of them will be found in the works of M. Ricord and Mr. Acton.

73. *C. Small Tumours* are sometimes formed in the *scrotum*, and are described as *tubercles*, or *gummata*, either in connection with disease of the testes or independently of it. They occur as a tertiary symptom in the deep layers of the scrotum, and sometimes implicate the testes, or are mistaken for affections of these organs. They never appear before the fifth or sixth month from infection; but they may occur after many years. They mostly appear as small elastic tumours, and feel as if they were filled with a gummy matter. As they grow they become painful, inflamed, and the skin covering them softens and ulcerates, and a deep ulcer follows a copious puriform discharge. The edges of the sore are undermined, and the adjoining parts are involved in the destruction.

74. *D. Syphilitic disease of the periosteum and bones*, generally commences with tenderness in the situation of the more exposed and superficial bones,

especially in the bones of the nose, in the tibia, ulna, cranial bones, clavicles, &c. The tenderness and pain become aggravated in the evening, last all night, but cease altogether or abate during the day. The pain is followed by oblong swellings or *nodes*, caused by the inflammation of the periosteum, and by the infiltration of lymph and serum. These swellings are tender, and the skin over them is at first pale and moveable. They present to the touch a doughy character, or an obscure sense of fluctuation. Dr. DRUITT remarks that, "if the disease is arrested at this stage, it causes merely a superficial deposit of rough porous bone, from the organisation of the lymph effused; or else consolidation of the bone itself, through deposition of fresh osseous matter into its cancelli. If the disease proceed one step further a quantity of glairy serum is effused between the periosteum and bone, producing an exquisitely painful fluctuating tumour. If it advance still further, the bone becomes carious; matter forms between it and the periosteum; extensive exfoliations ensue; the patient suffers severely from the pain and discharge;" and if the disease be seated in the cranium or os frontis — *corona Veneris* — death may ensue from extension of disease to the dura mater, or from protrusion of the brain through the eroded apertures in the skull. Such extreme cases are now very rare, but they were common enough many years ago, and when it was supposed that mercury given in excess was the only cure for the distemper.

75. *E.* Disease of the *bones of the nose* is often amongst the earliest of the tertiary symptoms, but it is of only occasional occurrence, and sometimes not until an advanced period. The nose may become diseased, as stated above (§ 66.), from ulceration of the mucous membrane; but the formation of internal nodes on the palate, vomer, ethmoid, and bones forming the bridge of the nose, may cause these bones to be carious, and probably the spongy structure of these bones may contribute to this even so quickly as it is sometimes observed. In rare cases these bones are nearly destroyed before the nature of the disease becomes apparent. When caries of the os frontis near the roof of the nose takes place the disease may extend to the ethmoid bone, and produce the worst effects. The existence of a deep-seated pain in the palate, and at or near the root of the nose, with or without a fœtid discharge, should always be viewed with suspicion, especially if either primary or secondary symptoms have existed at some previous period, although very remote, and apparently altogether removed. Ozæna may proceed from scrofula, scurvy, or even from chronic cephalic catarrh; but in 99 cases out of 100 it is the result of syphilis in the circumstances just named.

76. *F.* The *joints* are not frequently nor so quickly affected as the bones. Large gummy swellings sometimes, however, form around the ankle, knee, and elbow joints, owing to venereal disease; and in rare cases even the joints themselves. In two instances I was consulted where nearly all these joints were remarkably swollen and diseased, consequently upon other serious syphilitic affections. In a third — that of a late M.P. — amputation of the leg above the knee had been performed by Mr. DALRYMPLE, of Norwich, and the case subsequently came under my care. The small bones of the extremities may also be similarly affected. In venereal diseases of the joints it is difficult to determine, as I have not seen these cases terminate fatally, although they doubtless occasionally do, whether the disease is entirely external to the joint itself, or whether the articulations or the ends of the bones are also implicated by the disease. That the cartilages are sometimes eroded, and even the ends of the bones or their epiphysis also are affected, may be inferred not only from the case for which amputation was performed, but also from what is observed to occur as regards the cartilages and bones of the nose. These local syphilitic diseases — of the bones, joints, &c. — are generally attended by a slow or *syphilitic hectic*, and with the several constitutional phenomena described hereafter as the syphilitic cachexis.

77. iv. THE SYPHILITIC CACHEXIA. — It may justly be asked, can syphilis so contaminate the constitution as to give rise to dangerous or even fatal results of a different kind, or in addition to those which have been described above as secondary and tertiary? To this question I cannot hesitate to answer in the affirmative. These results do not often occur in the present day; and even the most severe of the tertiary affections noticed above, although sometimes terminating fatally, have not always this issue. In their most unfavourable results, it is often difficult to say how much may be imputed to treatment. But, irrespective of the more severe and dangerous of the affections already mentioned, states of the system may be induced, attended by marked severity or imminent danger, in which none of these affections had appeared, or, if they have appeared, at some previous periods they had been removed by medical treatment or regimen. This dangerous state of constitution — this the most remote or advanced of the effects of the syphilitic poison — has not been overlooked by previous writers, more especially by Dr. COLLES and M. RICORD.

78. Syphilitic cachexia is generally a consequence of a single constitutional contamination — *such contamination not occurring twice* — and is favoured by the following circumstances: — 1st, by an originally weak or bad constitution, by scrofula, scurvy, and a peculiar or vitiated diathesis, previously to the venereal infection; — 2d, by the persistence of certain severe syphilitic symptoms; — 3d, by an ill-timed or badly managed treatment, and by neglect of treatment; and 4th, by causes which tend to lower the vital powers subsequently to infection, — such causes, according to my observation, being excessive sexual indulgences, masturbation, exposure to cold and moisture, to the continued influence of malaria, or to noxious exhalations, &c.

79. *The symptoms of syphilitic cachexia* are not always well defined; for they may be associated with certain of those already noticed, or they may appear as the sequelæ of some of the more severe of them, or they occur at periods so remote from them as to occasion grave doubts of their nature and origin. They may, however, be stated to consist chiefly of pallor, sallowness, and anæmia of the surface, flabbiness of the flesh, emaciation, debility of both body and mind, various anomalous scorbutic or cutaneous appearances, hectic or continued nervous fever, night exacer-

bations, diarrhœa, sweats, aphonia, and ultimately death, arising from some important internal organ experiencing disorganisation, to which it may, previously or subsequently to the venereal infection, have become predisposed. Thus the patient may be cut off by extreme anæmia, by diarrhœa terminating in ulceration of the intestines, by affections of the lungs, &c.

80. Sometimes, after the patient has improved, under treatment for various secondary or tertiary symptoms, in respect both of these symptoms, and of flesh, strength and appearance, he begins to exhibit a much less favourable aspect. He appears sickly, loses flesh, presents a waxen hue, complains of loss of appetite and strength, of want of sleep and of night sweats. If any eruptions or other syphilitic symptoms are present, they may disappear, and yet the general constitutional cachexia may long remain, or even become more marked; or, if the local symptoms continue, they may be slowly deteriorated. Thus tubercular eruptions, or pains in the joints and bones may continue in various grades of severity for some years, whilst the constitution is slowly wasted, anæmised and visibly contaminated. In some cases the local symptoms, in the course of the general breaking down of the frame, are so changed as hardly to be recognised as venereal,—various local or visceral changes, the consequence chiefly of this cachexia, or of the treatment, being developed, and *masking* the venereal affection and its effects. This formerly obtained more remarkably when the treatment by mercury was carried to excess. There can be no doubt, however, that, even independently of this, or of any other treatment, the venereal cachexia may terminate fatally by calling latent tendencies into action, and by developing disease in vital or other internal organs. It may, however, be most manifest in all its indications, even when the local affections are comparatively slight; or, although they have been severe, after they have entirely or almost altogether disappeared. The local affections, as well as the constitutional contamination are often developed, hastened, delayed, or aggravated by a number of circumstances, influences, and concurring or reinforcing *causes* (§ 115. *et seq.*), to which the patient may have been exposed subsequently to the period of infection. During syphilitic hectic or cachexia, not only may the contingencies now alluded to appear, but there are several others which may also supervene; namely, paralysis, epilepsy, hypochondriasis, melancholia, monomania, and even more or less general insanity. These disorders of the mind are, however, seldom met with even in the most advanced states of constitutional syphilis — the intellect being generally but little, or not at all, affected to the last.

81. v. *The Diagnosis of constitutional syphilis* is often very difficult, more especially when patients deny that they have had any primary symptoms, or even any suspicious intercourse, or even any sexual intercourse whatever. These last circumstances are, however, very rare, or may even be considered next to impossible. But the rare modes of communicating the distemper, independently of sexual connection,—much more common in former times than now,—should not be forgotten. These modes will be noticed in the sequel (§ 110. *et seq.*). If, however, copper-coloured eruptions, sore throat, loss of hair, enlargement of the glands around the occiput, pains in the joints, periosteum or bones, periosteal nodes on the long and superficial bones, with night pains, a faded, pallid, or waxen and unhealthy look, loss of flesh and strength, be complained of; and more especially if these symptoms follow a somewhat similar succession, and cannot be attributed to locality, diet, regimen, &c., or to any recognised visceral disease, they may be confidently referred to constitutional syphilis. Where, however, neither the above succession of symptoms, nor many of them, appear, the difficulty of diagnosis will be much greater, especially if primary symptoms be not admitted; but, if admitted, there can be no doubt of the nature of the disease, although a long period between the existence of the primary symptoms and the appearance of those which are doubtfully secondary may have intervened. It has been stated above, that the period to which the supervention of secondary and tertiary symptoms upon the primary may extend may be very long — may even extend to several years; but the exact term to which this interval may be extended has not been ascertained. Its duration evidently depends upon a variety of causes and circumstances (§ 115. *et seq.*).

82. vi. SYPHILIS IN CHILDREN. — *Syphilis Infantum.* — *Hereditary Syphilis* differs so far from the disease as it occurs in adults, as to induce some writers to doubt its venereal origin. It is certainly the transmission of the constitutional contamination or distemper to the fœtus, during utero-gestation, and not the infection of the fœtus during parturition. The malady may exist at birth, or may not appear for some days or even weeks after birth. It is indicated by copper-coloured spots on the cutaneous surface, especially about the arms, genitals, and mouth, which may go on to ulceration. There are also a peculiar shrill or hoarse voice, excoriations and ulcerations, or an aphthous appearance, at the corners of the mouth, on the tongue, throat, and palate. In more advanced stages, emaciation and a senile appearance of the countenance; snuffling, or obstruction of the nose, enlargement of the glands, general cachexia, terminating in death, if the disease be not early detected and judiciously treated, and even in such favourable circumstances the child may be carried off by some severe complication. In most of the cases of syphilis infantum, the mother has been stated to have infected the fœtus. I believe, however, that the infection has not always proceeded from the mother only. SCHENCK adduces an instance (*Observ. l. vj. no.* 21.) of the infection of the fœtus from the father, the mother being unaffected. It must, however, be admitted that it is very difficult to prove the mother to have been untainted by the distemper, when the father has been affected. Upon the whole it may be generally expected that the fœtus will manifest the disease when the pregnant mother is constitutionally affected; and it is not improbable that the child may be infected by a constitutionally syphilitic father, without the mother having manifested any symptoms of the constitutional or primary distemper. MAURICEAU, however, has adduced instances of the child having been free from syphilitic taint, although the mother was affected; and I know cases of the children being free from

syphilitic taint although their fathers were constitutionally affected; but these children presented more or less of the scrofulous diathesis, or died in infancy. "The child may be also affected after birth, by a nurse suffering under syphilitic ulceration of the nipple, or by its mother under the same circumstances, if the disease of her nipple has been derived from a strange child; but no instance is known of a child infecting its own mother, although it will immediately communicate the disease to a strange nurse." The infection of the nurse is manifested by ulceration of the throat, identical with that succeeding primary disease, by cutaneous eruptions, by the formations of excrescences about the pudenda, which are capable of affecting her husband, in whom the infection is likewise followed by constitutional symptoms. Hunter believed that secondary symptoms could no longer infect; but this opinion is disproved by many very experienced writers, and by several instances which have come under my own observation. There can be no doubt that during the 16th and 17th centuries, the communication of the distemper, and even in more recent times, by secondary symptoms was remarkably frequent. This circumstance shows the intimate connection, if not the identity, of syphilis with yaws, sibbens, and some other diseases, which, in this and many other characters, differ in no respects from syphilis, as will be shown in the sequel.

83. Dr. Rizzi, of Milan, has recorded the results of his extensive experience of congenital syphilis, and has confirmed the remarks of Dr. Colles. According to Dr. Rizzi, if a woman contracts syphilitic ulcerations of the breast by suckling an infected infant, mucous tubercles frequently appear on the vulva and about the anus. The syphilis, although secondary, is transmissible by contact, so that an innocent woman may communicate the distemper to her husband. Of this fact the physician should be fully aware. Of 100 persons with chancres on the breast from impure lactation, or in the mouth or throat from contact with an infected infant, 34 had tubercles of the vulva, 19 syphilitic angina, 2 iritis, 14 tubercles of the vulva and angina simultaneously, 5 tubercles of the vulva and others disseminated over different parts of the body, 6 tubercles of the vulva, angina, tubercles of the skin and iritis, and 19 no secondary symptoms. In nurses, as well as in men infected by them, Dr. Rizzi found tubercles the most common form of secondary symptoms, and angina often superadded. Discharges, vegetations, and exostoses were rare, and buboes, when they occurred, consisted only of swelling and tension of the sub-maxillary or axillary glands. (Ranking's *Abstract, &c.* vol. v. p. 250.)

V. Varieties or Modifications of Syphilis, — Syphiloid Diseases.

i. Syphilis Æthiopica.—*Syphilis vel Lues Æthiopica —Syphilis Africana —Yaws —Sibbens — Sivvens.— Pian, Epian,* Fr.— *Frambœsia.*

84. This distemper has existed in Africa, certainly, for ages before the epidemic outbreak of syphilis in Europe at the end of the 15th century; and, if not identical with, is at least a form or modification of, the disease which existed in the West Indian Islands, when they were discovered by Columbus, and which was considered as intimately resembling, if not the same as, the epidemic syphilis of the 15th and 16th centuries.

85. The African syphilis, or the *yaws*, as commonly termed, in all respects more closely resembles the earlier manifestations of syphilis in Europe than the modern occurrences of this distemper. Indeed the few cases of yaws which I saw in Africa in 1817 agreed with the early accounts of syphilis so prevalent in Europe in the 15th and 16th centuries; not only as respected the character and severity of the distemper, but also as regarded the modes of its communication and the treatment of it found most beneficial. That the yaws in Africa is identical with the yaws or *pian* of the West Indies, is also undoubted; and it is most probable that the identity existed before the discovery of America. The descriptions of the disease, as observed in Africa and in the West Indies, agree as closely as the descriptions of any specific disease furnished by different writers, whether as occurring in Negroes or in Mulattoes. It is very rarely observed in white persons in modern times, as it is especially dreaded, and hence avoided by them. That it is also the same disease as the *sibbens* or *sivvens* formerly seen in the west of Scotland, is admitted by those who have seen both maladies. Dr. Thomson remarks that he possesses the notes of an old physician in Jamaica, who visited a part of Scotland where the *sibbens* was prevalent; that these notes were made without any regard to theory; and that his observations confirm the identity of yaws and sibbens. (*Edin. Med. and Surg. Journ.* vol. xv. p. 321, and vol. xviii. p. 31.)

86. This complaint is usually preceded by severe pains in the limbs, often resembling those of rheumatism, which are most severe around the joints. The pains are attended by languor and debility, and often continue for several days without any other appearance of disease. These symptoms are generally precursory, and are succeeded by more or less fever, sometimes preceded by slight rigors. In many cases, however, the fever is so slight as hardly to be noticed. Generally the patient complains of headache, loss of appetite, and pains of the back and loins, which are exacerbated towards evening. These symptoms are continued for several days, and are followed by an eruption of pustules, more or less numerous, in various parts of the body, but especially upon the face, neck, groins, pudenda, and around the anus, vulva, &c. The eruption of these pustules is not completed over the whole body at one time, nor do they appear in any regular succession on the different parts; but while one crop is falling off, another is making its appearance in other places. Every fresh eruption of pustules is preceded by a slight febrile paroxysm. The pustules are filled with an opaque whitish fluid: they are, at their first appearance, not so large as the head of a small pin; but they grow larger gradually, until they attain the size of a sixpence or even of a shilling. When the pustules burst, a thick, viscid matter is discharged, which forms a foul and dense crust or scab upon the surface. The number and size of the pustules is proportioned to the degree of eruptive fever. When the febrile symptoms are slight, there are few pustules, but they are mostly of a larger size than when the complaint is more violent. From the larger pustules red fungous excrescences frequently arise of va-

rious magnitudes, from the size of a pea to that of a large mulberry, which fruit, owing to their rough, granulated surfaces, they somewhat resemble. These fungi, though they rise considerably above the surface of the skin, have but a small degree of sensibility. They never suppurate kindly, but gradually discharge a sordid glutinous matter, forming an ugly scab round the edges of the excrescence, and covering the upper parts of it, when much elevated, with white sloughs. When these eruptions appear upon any part of the body covered with hair, the colour of the hair is gradually changed from black to white. At the commencement of the disease, when there is any doubt of the nature of the complaint, the natives open one of the pustules and drop upon it a little of the juice of the capsicum: if it be of the yaws species, little or no pain is excited.

87. The eruption is more elevated and broader, and more numerous in the face, groins, axilla, verge of the anus, and labia majora, than in any other part of the body. The crops of yaws are various. In some there is only one copious eruption, of a healthy nature, with well-defined edges; it continues on the skin for a long time, the patient enjoying his usual health. This is the most favourable form, and in the robust and well fed, is terminated in seven or nine months. More frequently small watery yaws appear, and recede in a month or so. The patients lose flesh; become cachectic, and dropsical; but in these a nourishing diet will often in a month or two induce a return of the eruption in a more copious and larger form; and several crops of such eruptions may successively appear. When the disease attacks the throat, the soft parts are always lost. If there be any tendency in the constitution to hereditary or visceral disease, it is generally excited into action, especially upon the disappearance of the eruption; and caries of the bones, disease of the joints, dropsy, &c. supervene. In the successive eruptions of yaws, there is often one ulcer which does not heal, but becomes larger than the rest, and if neglected is apt to produce caries of the adjoining bones. Nocturnal pains, swellings of the periosteum, ulcers of the pharynx, &c., generally attend the advanced course of the distemper; and are accompanied by chronic hectic, and general cachexia. If the infection takes place in the mouth or lips, ulcerations appear in these parts, and extend to the fauces, palate—the bones of the palate and those of the nose becoming implicated.

88. *The duration* of the period elapsing from exposure to contagion to the commencement of the eruptive or febrile symptoms varied in several cases, accurately observed by Dr. THOMSON, from seven to ten weeks. In some cases in which he had recourse to inoculation, the eruption appeared in seven weeks. The duration of the disease after the appearance of the eruption varies from some months to several years. It depends upon the complete eruption of the pustules. When the eruption is slight, the pustules being few and small, the hectic cachexia and complications superinduced prolong the distemper, and ultimately occasion death, the eruption having long previously disappeared.

89. ii. SIBBENS OR SIVVENS.—This form of syphilis was formerly seen in the south-west of Scotland, especially in the counties of Ayr, Galloway, and Dumfries, but is now entirely extinct. The descriptions given of it by ADAMS, HALL, GILCHRIST, HOPE, BARRY, and others, show that this is the same disease as the yaws, and the syphilis epidemic in the 16th century. Indeed, yaws, sibbens, and other forms of syphilis about to be noticed are merely modifications of the same specific distemper, owing to local circumstances, manner and habits of living, &c.; these forms being in no respect different, as to their modes of communication, from the malady of the 15th century. The syphilis of the present day is that form which has become most sensibly modified in the course of ages, but which, under circumstances of neglect, unwholesome living, want of cleanliness, &c. will in most cases assume as virulent and infectious a character as was displayed by it when first disseminated throughout Europe.

90. *Sibbens* shows itself, according to the mode of infection, in modified states, especially at its commencement. Like yaws and other forms of syphilis about to be noticed, it was communicated by sexual intercourse, by mercury, by the common use of the same utensils, of the same bed-clothes, especially when blankets only were slept in, and by want of cleanliness, and by two or more sleeping in the same bed, as not unusual in former and even in recent times. In infants at the breast, and in children, the distemper appeared first in the throat and mouth, with inflammation of the velum palati and adjoining parts, followed by a whitish eschar, or a superficial red ulcer. At the same time white spots, eschars, and small elevations of a pearly or milky colour occurred on the insides of the cheeks, lips, &c., and in these situations, excrescences, or small fleshy growths, resembling a raspberry, which became covered with a scab, were afterwards developed. These excrescences were diagnostic of the malady. This state, when neglected, or occurring in cachectic or debilitated subjects, was followed by destructive ulceration and extension of the mischief to the pharynx, larynx, &c., with loss of the velum palati and affection of the bones of the nose, face, &c.

91. In others, after pains in the joints, bones, and febrile symptoms of varied duration, the disease appeared in the skin, under somewhat different aspects. The whole surface of the body was often spotted with a coppery or dusky-red eruption. In many clusters of pustules broke out, followed by successive desquamations, or scabby eruptions of the scalp, forehead, insides of the thighs, accompanied by little hard tubercles in the skin. In some, tumours resembling furuncles were seen in various parts, and gave rise to ulcers which perforated the integuments. These ulcers were supposed to be produced by the virulent matter of the disease having come in contact with the surface, as when the disease had been caught by sleeping with the infected, or in the same foul blankets as had been used by an infected person. Ultimately soft, spongy, raspberry-like tumours (hence the name *frambœsia*, sibbens, sivvens) broke forth in various parts of the body. Affections of the bones were not observed by some; but BELL and others mention *nodes* and *caries*. The affections of the genitals, when not occurring primarily, owing to the contagion affecting the surface of the body, sometimes appeared consecutively. Different cases presented somewhat different appearances, mani-

festly owing to the parts primarily infected and affected, and to the progress the distemper had made when arrested by treatment. The disease was often fatal in children and infants in whom it had made progress before submitted to treatment.

92. iii. PIAN or EPIAN is the term usually applied to yaws, as observed and described by physicians who have practised in the French West India Islands, and although manifestly the same disease as yaws, and as syphilis at its earliest appearance in Europe, presents a few differences in the character of the eruption, especially, according to the descriptions of these physicians. The patient experiences slight fever, with pains in the limbs and bones, and small red spots on different parts of the body. He loses flesh, and the skin becomes scaly. The intensity of these symptoms slowly decreases, but the eruption is developed, and assumes *three* aspects. The first, or *large pians*, sometimes become as large as the hand, from which fungous excrescences shoot, and a thick sanious matter exudes. The *small pians* are much less in size and more numerous than the former; their excrescences are redder and less fungous. The *red pians* are larger than the latter, but less than the former, of a flesh colour, and are developed slowly and successively; but are accompanied and followed by more serious symptoms than those of the other two varieties, particularly those of the first, which is the mildest.

93. One of the ulcers of pian generally becomes larger than the others, forming a deep ulcer of a bad character, without fungi, discharging much sanious matter. It is aggravated by the usual dressings, and is called the *mother pian*, as a similar large ulcer in yaws is called the *mother yaw*. It is dangerous to dry it up before the general infection is fully manifested. In this variety, as in yaws, if a patient has an ulcer on any part of his body before the infection of pians, the first pustules are developed upon it, and the ulcer often becomes the mother pian. This variety of syphilis, if allowed to proceed, is followed by further alterations. These consist chiefly, 1st, of excrescences on the soles of the feet and palms of the hand, which are tender at first, or before they break, but which, when they break, discharge a purulent matter; 2d, of thickenings of the skin of the soles of the feet and palms of the hand. These are red, painful, tender, and hardened, but without exudation. 3d, of wandering pains in the bones, of the tumefaction of the spongy bones and of the extremities of the long bones, attended by caries, softening, exostosis, &c. This state of the disease, called *bone-evil*, is often attended by the formation of numerous ulcers, by affection of the bones of the face, of the palate, &c.; the patient often being reduced to a horrible state. The chief difference between yaws, pian, and syphilis, in its aggravated state of secondary disease, is in the fungiform aspect of the ulcers in yaws and pian; but this state of the eruption in these affections (*Frambœsia*), is probably to be imputed to the peculiarity of the skin and habit of body of the Negro, in whom this distemper was observed by those who have described it. The following accounts of the occurrence of syphilis as local epidemics are interesting, inasmuch as they exactly agree with the descriptions given of syphilis in the 15th and 16th centuries.

94. iv. DISEASE OF ST. PAUL'S BAY (*Canada*). *Le Mal de Chicot*,—prevailed between the years 1776 and 1780, not only in this locality, but also in some other parts of Canada. It was described by Dr. BOWMAN, who was ordered by the Governor to investigate the distemper. In children most frequently the disease commenced with aphthous pustules on the lips, tongue, and inside of the mouth. These advanced rapidly, and the tongue, palate, &c., were sometimes nearly destroyed by them. The whitish puriform matter exuded from them communicated the disease to others. Older patients complained of pains of the bones, and of slight febrile exacerbations, until eruptions followed by ulcers appeared on the skin, and in the mouth and throat, when the pains abated. These ulcers, according to their situation, which depended upon the contact of the virus, were followed in many instances by cervical, axillary, or inguinal buboes. At a more advanced stage the body became covered with pruriginous tetters, which soon disappeared. The bones of the nose, palate, cranium, pelvis, and extremities, were ultimately attacked by nodes, and caries. The frame appeared altogether contaminated, all the functions disordered; and many sunk in a state of extreme wretchedness, especially children, the weak, and neglected. Robust persons withstood the successive complications of the distemper for many years.

95. The inhabitants of the parts where the disease appeared, stated that it was introduced and extended by sexual intercourse, by contact, and by foul clothing. It spared no one exposed to infection, but was most virulent in children. SWEDIAUR, admitting the imperfections of the description given of the distemper by Dr. BOWMAN, considered that it agreed with the earliest accounts of syphilis in the 15th and 16th centuries. It is also manifestly the same malady as that which was epidemic in 1800, and in following years until 1809, in districts of *Scherlievo, Grobmico*, *Fiume, &c.*

96. v. THE SYPHILIS OF SCHERLIEVO, or the epidemic which received this name from its prevalence in this locality. MM. PERCY and LAURENT, state that, in this district and those adjoining it the commission appointed to inquire into the nature of the distemper, found more than 13,000 persons infected by it, out of a population of 38,000. It reappeared, or became epidemic again, in 1808 and 1809, where it seemed to have been perpetuated by the filth of the lower orders, whose damp cabins were shared with their domestic animals. The disease usually commenced with lassitude of the limbs and pains in the bones, which increased during the night. The voice became hoarse, deglutition difficult, and the velum palati, uvula, the tongue, and pharynx, red and aphthous. Soon after the aphthæ burst and discharged an ichorous matter, which eroded the adjoining parts. Ulcers afterwards were formed, which extended into each other, creating sores of various dimensions, but always rounded, of an ashy colour, and with hard or raised and dark red edges. These ulcers were seated chiefly in the tonsils, uvula, velum palati, tongue, and cheeks, and were followed by caries of the bones of the face and nose, and the discharge of foul, fœtid pus. The voice was more and more changed, and at last lost, from ulceration extending to the larynx. The exostoses

and nodes in rare cases vanished along with the pains, as soon as a pustular eruption was evolved on the skin.

97. In many cases, after the pains in the bones a pustular eruption appeared on the surface, which M. Boué states to have been announced by itching, which disappeared when the eruption was fully out. The pustules were of a coppery colour, round, and of various extent; and appeared most frequently on the forehead and hairy scalp, on the inner surface of the thighs and extremities, and around the anus and genitals. In some cases an acrid ichor exuded from them, which excoriated the skin; in others the discharge dried and formed scabs. The disease often remained stationary in this state for a long time. After the scabs had fallen off, the skin retained marks of a coppery hue, which were removed with difficulty.[*]

98. The disease appeared in some cases with various sized blotches of a coppery colour, in the centres of which ulcers were formed, from which a matter was exuded which formed scabs similar to those which covered the pustules. These blotches were surrounded by a coppery areola. It was remarked that the female genitals were more frequently affected than the male. Dr. Cambieri, among an immense number of cases, found only one of gonorrhœa, which complicated the distemper. The ulcers which often eroded the scrotum were consequent upon the general infection. Buboes in the groins, or enlargements of other lymphatic glands, were seldom seen. The modes of communicating the malady were the same as those which will appear in the sequel (§ 109. *et seq.*)

99. VI. Diagnosis of Syphilis.—This is often very difficult; for although the distemper has generally presented a modified and milder character in modern times, nevertheless cases sometimes occur which, owing to neglect, to constitution and habit of body, to treatment and manner of living, are as virulent as many of those which were described by writers in the sixteenth century, or of those which have been termed *syphiloid diseases*. It will have been remarked, from what I have stated above, that I consider these latter as identical with the early manifestations of syphilis in Europe; the differences actually observed being only such as arise from the manner of infection—from the exudation from the cutaneous and other parts, during the constitutional disease, having infected these parts in persons with whom these exudations had come in contact, and from differences of race and other circumstances (§ 109. *et seq.*) That the disease assumes a different character as respects the different races, may be expected, in as far as the integuments are concerned; for, owing to the structure and vital condition and functions of the skin, and to the asthenic diathesis of the dark-skinned races, and more particularly of the Negro, syphilis attacks these structures with greater severity than in the white race,—although even in this there are often exceptions,—and assumes in the former the characters described under the head Yaws and other Syphiloid Distempers. As regards the treatment, that found most beneficial in the one is also most beneficial in all the others. I have seen small-pox in the Negro in Africa, and yaws in the same race; and the difference of the former malady in the Negro from that observed in the white race is as great as that of the latter disease is from secondary syphilis in the white. The causes, efficient and concurring, are the same in character; the treatment is also the same; and this being admitted as respects yaws, the inference must necessarily extend to the other modifications of the distemper belonging to this category.

100. *The diagnosis of Constitutional Syphilis*, as it occurs in the present day in the white race, and after the virus has passed through many generations, is often very difficult, even when aided by the history of the case; and this difficulty is increased by the different tissues and parts which are secondarily affected, either singly or conjointly. Mr. Holmes Coote has classed the *secondary* effects of syphilis as follows, and to these I may add the *tertiary*:—

101. i. Secondary Symptoms or Effects.—1. *Cutaneous eruption.*—*a.* Erythema; *b.* Scaly eruption; *c.* Papular eruption; *d.* Pustular eruptions; *e.* Tubercular eruptions.—2. *Mucous tubercles, or condylomata.*—3. *Ulcerations between the toes, Rhagades digitoria.*—4. *Superficial ulcerations of*:—*a.* The meatus auditorius externus; *b.* The navel; *c.* The nose; *d.* The lips and the angles of the mouth.—5. *Syphilitic affections of the tongue.*—*a.* Excoriations of its surface; *b.* Ulcerations, fissures, &c.; *c.* Induration of its substance.—6. *Ulceration of the gums.*—7. *Ulceration of the tonsils—Soft and hard palate.*—Excoriations of these parts without ulceration.—8. *Ulceration of the pharynx.*—9. *Ulceration extending to the rima glottidis.*—10. *Affections of the eye and appendages.*—*a.* Ulceration of the eyelids; *b.* Iritis; *c.* Sclerotitis.—11. *Ulceration of the roots of the nails.*—12. *Alopecia, or baldness.*—13. *Ulceration of the rectum and large intestines.*—Syphilitic dysentery.

102. ii. Tertiary Effects.—1. *Tubercles or gummata.*—*a.* Of the skin and cellular tissue; *b.* Of those parts passing into phagedenic ulceration; *c.* Of muscular and fibrous structures.—2. *Inflammation of the periosteum.*—3. *Inflammation and enlargement of joints.*—4. *Diseases of the testes.*—*a.* Inflammation and enlargement of one or both testicles; *b.* Atrophy or other structural lesion of the testes.—5. *Inflammation of bone and its effects.*—*a.* Pains in the bones; *b.* Exostoses; *c.* Caries.—6. *Inflammation and structural change of the eyes, eyelids, or lachrymal apparatus.*—7. *Phagedenic ulceration of the scalp.*—*a.* Without disease of the pericranium and subjacent bones; *b.* With disease of these parts.—8. *Phagedenic ulceration of the pharynx.*—*a.* Extending to the larynx, cartilages, trachea, &c.; *b.* extending upwards to the bones of the nose, face, and palate; *c.* extending to and causing caries of the cervical vertebræ.—9. *General syphilitic cachexia.*—*a.* Without any prominent visceral disease; *b.* With prominent disease of the viscus,

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[*] J. Bontius (*Medicina Indorum*, 4th Lugd. Bat. 1718) describes the "*Amboyna Pox*," in terms which are equally applicable to *yaws*, *sibbens*, and other varieties of syphilis, and states that the disease is indigenous to Amboyna, the Moluccas, and other eastern islands. He says that it is identical with constitutional syphilis; but differs from it in being most frequently communicated otherwise than by sexual intercourse. He states that the remedies employed for its cure, are preparations of mercury, of antimony, sarsaparilla, guaiacum, china root, &c.

as the lungs, &c.; *c.* With paralysis; *d.* With dropsy, &c.

103. It is not to be expected, that the lesions belonging to the *first* or the *second* of these classes of constitutional disease will appear singly. On the contrary, they are generally associated in various forms or groups; affections of the skin being often complicated with those of the throat, tongue, gums, &c. Affections of the joints may be conjoined with inflammation of the periosteum and bones, and with phagedenic ulcerations. Even various tertiary lesions may be accompanied with one or more of those which are secondary; or, more correctly, certain secondary affections, such as those of the skin and throat, may persist, although one or more tertiary alterations are fully developed. Thus, in a case which I saw with Sir B. C. Brodie there were ulcerations of the throat, pharynx, larynx, nodes, pains in the bones, &c., consequent upon syphilitic eruptions and cutaneous ulcerations, which still remained, the pharyngeal ulcerations implicating the cervical vertebræ. The disease in this case was preceded by suppurating buboes. In another case, which I attended with the late Mr. Copland Hutchison, there were extensive ulcerations of the skin; nodes, caries of the bones of the nose and palate, inflammation of both eyes and eyelids, remarkable enlargement of the knee and elbow-joints, phagedenic ulceration of the scalp, and general cachexia. In other cases, in addition to affections of the bones and joints, there were phagedenic ulcerations of the pharynx, with inflammation and necrosis of the palate and nose, enlargement of the bodies of the testicles, and large ulcerating tubercles of the integuments.

104. *The diagnosis of Syphilis* depends chiefly upon the history of the case, especially as respects the existence of primary symptoms of buboes, and exposure to infection by direct or indirect contact, more especially by sexual intercourse, suckling, &c. (See the Causes, § 109. *et seq.*) The *eruptions* in the secondary stage will generally indicate the nature of the malady; but even all that has been stated above (§§ 57. 81.) on this subject may not be sufficient for this purpose, if other particulars be not sufficiently considered. The *colour* of syphilitic eruptions, although generally yellowish or coppery, especially before they ulcerate, may be of a brighter hue, if febrile action be present. In rare cases, the pustular eruptions may very closely resemble the eruption of small-pox; but a few days will disclose the differences. These eruptions and their rapid enlargement and ulceration in the early history of the distemper were very common, and hence the name of *great-pox*, very commonly given to them. Mr. H. Coote very correctly remarks that syphilitic eruptions do not always preserve the same type in the same individual. The scaly and tubercular, or the scaly, papular, and pustular, may be combined in the same case; and a scaly eruption may exist on the trunk and a pustular on the scalp. A scaly eruption often becomes tubercular as the constitutional cachexia advances. Scaly and papular eruptions are often co-existent both terminating in desquamation, leaving copper-coloured stains. Large tubercles of the integument pass into deep, excavated, or phagedenic ulcers, and may be attended by the usual forms of rupia. Syphilitic scaly eruptions are generally circular, and more strictly resemble lepra, than psoriasis. The eruption on the trunk is often different from that on the extremities; on the former it is more generally erythematous, papular, scaly, and pustular; on the latter it is often tubercular, passing into large and deep ulcers with elevated edges, especially on the lower extremities. Rupia, however, may equally affect all parts.

105. Syphilitic erythema usually precedes other eruptions, but it may continue in the form of dull red or coppery patches, or co-exist with other eruptions. The most common eruption is syphilitic lepra, the scales of which are dark, and differ widely from the silvery scales of lepra vulgaris. This eruption may extend over the whole body, causing the hair to fall off, and affecting the palms of the hands and soles of the feet. It spreads into mucous outlets and canals, into the nasal, buccal, anal, vaginal, and others, where it causes ulcers, fissures, tubercular elevations, excoriations, discharges, &c. Lepra syphilitica often attacks and excoriates the scrotum, and is frequently attended or followed by foul ulcers between the toes, mucous tubercles about the arms, in the axillæ, groins, or where the transpiration of the surface is allowed to accumulate. The elevation of the scales of lepra into copper-coloured tubercles is always, according to Mr. H. Coote, associated with impairment of the general health, and is an indication, during a mercurial course, that the medicine is acting injuriously, that the treatment should be changed, or at least that the patient should be allowed a more generous diet, and a moderate amount of stimuli. The cicatrices from syphilitic sores, it may be remarked, are often characteristic, being usually rounded, depressed, of a dull white hue, and irregular on the surface.

106. *The tertiary effects of syphilis* may generally be recognised with greater certainty than the secondary. The history of the case, the antecedent symptoms and lesions, however remote, and the nature of these as inferred from their characters and succession, are to be taken into account. But there are hardly any of the lesions, which are termed tertiary, that may not be inferred to be one of the more remote effects of constitutional syphilis, when viewed and considered with reference merely to its own characters and relations. The mere enumeration (§ 101. *et seq.*) of these effects sufficiently indicates their nature; and are equally the results of neglected or injudiciously treated syphilis, as observed in the present day, and of the African yaws as observed by myself and others.

107. VII. The Prognosis of Syphilis manifestly depends upon so many circumstances as to be stated with much difficulty, and even with uncertainty. It depends not only upon the progress the distemper has made, and upon the effects observed; but also upon the health and constitution of the patient previously to infection, and at the time of his coming under treatment. Nor should the mode of infection, and the course it has pursued, and its recurrences when the distemper has become constitutionally chronic, be overlooked. If the patient be young, in previous good health, be not exposed to fatigue, cold, or anxiety of mind, and not given to excesses of any kind, a favourable opinion may be given both in the primary and secondary stages of the distemper. But if his health, strength, and constitution be manifestly

impaired; if he be dissipated, exposed to fatigue, and irregular in his habits; and more especially if the secondary effects be severe, be complicated, have been rapidly developed, or have reappeared after courses of mercury, or after other judiciously employed means, an unfavourable or at least a guarded diagnosis should be given, the danger of the case fully admitted, and due precautions for the guidance of the patient fully stated. In most cases ulcerations of the pharynx, owing to their disposition to extend to important adjoining parts, or to become phagedenic, should be viewed unfavourably, more especially in the circumstances just mentioned. The severer kinds of secondary effects should also be much dreaded in infants; and they are always most difficult to remove in patients of all ages when they are produced by the now infrequent modes of infection (§ 110. *et seq.*), which commonly prevailed in the 16th century, or by the discharges or exudations of secondary sores, either directly or indirectly coming in contact with the naked cutaneous or mucous surfaces.

108. *The tertiary effects* of syphilis are always attended by more or less present or prospective danger. But the imminence of the one, or the amount of the other, will depend upon the extent of lesion already produced, upon its complications and constitutional relations and effects, upon the history of the case, and upon the effects of appropriate treatment. When pharyngeal ulceration has become phagedenic, or has extended to the larynx, to the bones of the face, and to the eyes, the patient is in great danger; and this is more extreme if the cervical vertebræ become implicated. The same prognosis may be given if, with general and increasing cachexia, pulmonary, paralytic, or dropsical disease supervene, after obstinate, prolonged, or even rapid course of the distemper; although in some of these cases life may be prolonged for a considerable time under favourable circumstances, and suitable regimen and treatment. In this far-advanced category of morbid results an opinion of the issue will be based upon experience of the effects of the most influential medicines, upon the local and constitutional associations of each case, upon the previous and existing circumstances of the patient, upon the history of the malady, and upon the various influences which have modified its course. In respect of the tertiary effects of syphilis, I may state, that an opinion respecting them should always be given with caution and reservation; even although circumstances may not warrant that opinion to be unfavourable.

109. VIII. The efficient Cause of Syphilis, and the Causes aiding its operation.— The former has been very generally recognised, and its effects admitted; but all the modes and circumstances of its application and operation have not been sufficiently shown and considered. The latter have been either overlooked or imperfectly estimated, especially as regards the successive changes, promoted and brought to maturity, as manifested in the secondary and tertiary results of the poison. The *causation* of syphilis has been studied merely from what has been observed in modern times, and from the common way of propagating the distemper at the present day. But the more general way by which this infection was produced soon after its introduction into Europe, and during its epidemic prevalence, has been altogether overlooked; although, under the circumstances existing in these ages, it may be still propagated in the same ways, and its effects present as severe a character, and the same features as those which distinguished it in former times; and which still distinguish it in that form of the distemper which prevails in Africa, and which prevailed there from immemorial ages before it was introduced into Spain.

110. The contagion of syphilis at the present day, and for many years past, has arisen from sexual intercourse, either the male or the female being the subject of the primary disease. In these cases the infection is produced by the virus, poison, or morbid secretion of the primary sore. This mode is generally admitted, and is now, with very few exceptions, especially in Europe, the common mode, no other being acknowledged by many, the exceptions being altogether ignored. But I have had sufficient reason to conclude, that whenever a secondary venereal ulceration, seated on the integuments, or in the mouth and throat, produces a secretion or discharge, which comes in contact with a mucous surface, or with an abrasion of the cutaneous surface, or is even allowed to remain in contact with an unabraded surface, infection is liable to take place, and that this liability exists both in children and in adults. The communicability of secondary syphilis, especially when the sores have proceeded to secrete or produce a fluid exudation, was a well recognised fact in former times, and has been witnessed by myself during the course of my experience in several instances. It was a recognised fact by Dr. Colles; and although Hunter believed that secondary symptoms could no longer infect, Mr. Babington remarks, when commenting on this belief, that "the facts (that they do infect) are so well established, that it is more easy to question the principle than to doubt the facts."

111. Judging from what I have seen in several countries and climates, and in children and adults in this country, I conclude, that the morbid secretion from secondary sores, if allowed to remain in contact with the more susceptible surfaces or parts of a healthy person, will infect that person, provided that he be predisposed to, or susceptible of, the infection; and that the local contamination, at first confined to, and more particularly and severely affecting, the tissues first infected, will become general, and will the more readily and severely, by means of the secretion from the ulcers or sores produced in the course of the distemper, infect those to whom this secretion is either directly or indirectly applied. This mode of communicating the malady was often observed in all the varieties of it described above as syphiloid diseases, and in the usual manifestations of the malady, from the end of the fifteenth until the close of the seventeenth century, or even later. The extensive prevalence of syphilis during these centuries, although imputed by many, and probably not without reason, first to a leprous diathesis, and afterwards to a scorbutic diathesis, or to a complication of syphilis with leprous or with scorbutic symptoms, may be more correctly accounted for by the facts of the secondary, or early constitutional effects of the malady having become thus virulently contagious, both by this mode of communication, and by its successive propagation in this manner.

112. If we note the habits of the lower classes in those ages, the ready infection and the severity of syphilis are easily explained. As observed in the present day, with respect to yaws in Negroes, the contagion was produced by the secretion from the sores on the cutaneous surface, by mediate or immediate contact, much more frequently than by sexual intercourse. In the lower classes in Europe, in the 15th, 16th, and 17th centuries, the circumstances favouring this mode of communicating the malady were much more remarkable than in the Negro, with whom the disease most probably originated; for amongst this race its antiquity appears to have been the greatest, and by this race the distemper was communicated to the Moors and Jews in the North of Africa, and by them conveyed into the South of Spain, where it existed long before the expulsion of them from the Iberian Peninsula.* The lower classes in Europe during the centuries of the earlier prevalence of syphilis were remarkable for their neglect of cleanliness, for their use of woollen night and day clothes next to the skin; for the habit of two, three, or more sleeping in the same bed, often in a state of nudity; for drinking and eating out of the same vessels, and for these and other social conditions favouring the communication of the disease, in its secondary stage, independently of sexual intercourse.

113. With the progress of civilisation, and with the knowledge acquired of the communication of the distemper by these means, the infection of it otherwise than by sexual intercourse became less frequent; and the virus more generally having to pass through the absorbent system, when the genitals were the seats of primary infection, was either arrested in the course of its constitutional contamination, or rendered more mild, and slower in producing its successive specific effects, than when infection was produced by the virulent secretions from secondary sores applied to parts which more readily admitted of constitutional contamination. The successive propagation of the distemper in this latter mode, and generally without the intermediate interruption and amelioration resulting from the action of the virus on absorbent glands, without the production of buboes — manifestly rendered the malady more rapid and more severe, and was the chief cause of the early prevalence of syphilis being in some respects different from what is observed of it at the present day, but in every respect similar to the varieties mentioned above (§ 84. *et seq.*); many of the influences producing these varieties actually having existed at the time of, and for ages after, the introduction of syphilis into Europe.

114. As observation rendered persons aware of the habits and circumstances causing and favouring infection, more especially in the higher classes of society, these habits were reformed or refrained from. Persons no longer drunk out of the same glass or cup, or slept in a strange bed, without due precaution; and much of the manners of modern times originated either in precautions against infection, or in evincing a confidence that no precaution was required. But in whatever manner the infection may be produced, whether by primary sores on the genitals, where the morbid secretion was favourably placed to operate its effects, or by the secretions from secondary sores or ulcers in the cutaneous or in the mucous surface, under circumstances favouring their operation and consequent contamination—now occurring very rarely, in former ages very frequently — there are a variety of causes or influences which aid the efficient or exciting cause — the syphilitic poison — in developing, hastening, or in aggravating its constitutional or contaminating effects. These are so diversified and yet so influential, whether acting simply or in combination, as to require a brief but particular notice: and are first *predisposing*, and next *concurring* and *determining*.

115. *A.* The chief *predisposing causes* of syphilitic infection are infancy, childhood, and early age; delicacy of constitution, original or acquired; debility or temporary exhaustion; debauchery, fatigue, and irregularities of any kind; and the neglect of all those habits and social observances which constitute modern civilisation. The precautions observed in several cities and places against the propagation of the distemper manifestly tend not only to render it less frequent, but also more mild, than in other countries where no precautions are instituted, especially amongst those who more commonly are infected by, and who communicate the malady. But the predisposition, however produced, or in whatever form it may exist, favours not only the primary infection and effects, but also the development of the secondary or constitutional disease, and the tertiary results, if the morbid procession be not arrested by treatment; and, according to the amount of predisposition, will be the rapidity with which the morbid effects are produced. Doubtless, cases are not infrequent, which evince no particular predisposing cause of the infection, or of the rapidity or severity of the results; but these may be imputed to a diathesis, or some unascertained cause favouring the operation of the poison, or to susceptibility of infection and contamination inherent in some constitutions.

116. That all persons who have not been previously constitutionally infected are liable to syphilis, provided that the virus is applied in sufficient quantity, or is allowed to remain in contact with a part upon which it is capable of acting, may be inferred; but there is reason to conclude, from what has been observed in persons previously infected, that a second constitutional infection of syphilis rarely or never takes place, and that such an occurrence is merely the return, or the re-development, in a state of active manifestation, of the disease, which had been lurking, in a latent state in the body, and which various influences had reproduced independently of any second local infection. Whilst, therefore, all previously uncontaminated are liable to syphilis, those who have been thus diseased are not liable to a second

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* Dr. Winterbottom (*An Account of the Native Africans*, see vol. ii. p. 148.) remarks that "the yaws is not mentioned by authors as a disease which occurs in Egypt, though, from the frequent communication of that country with those parts of Africa in which the disease is endemical, we might be led to expect that it would be imported. There is reason, however, to suppose that the yaws does actually appear there, though mistaken for the venereal disease." He proceeds to remark that a Copt, who professed to cure the venereal disease in its advanced states, prescribed "two coffee-cups of flax oil to be taken every morning fasting," directing no regimen further than to keep the patient warm. The pustules and other eruptions he covered with a red earth common in some parts of Egypt. They gradually became dry, and left no mark. At the end of three months a cure was effected. It is further stated, that those persons who have been affected and fully cured have no fear of a second infection.

constitutional infection, provided that they have been completely cured; but they are liable to a return in an aggravated form of the secondary or tertiary disease, if it have not been completely eradicated, especially if they are exposed to the causes about to be noticed (§ 117, 118,); or in other words, that constitutional syphilis when cured renders the body unsusceptible of a second constitutional infection.

117. *B.* Several causes favour, 1st, the development of the constitutional disease from the local infection or primary sores; — and 2d, the aggravation and local manifestations of the syphilitic contamination, when it is not completely removed, but remains lurking in a more or less latent form, in the body. The most remarkable features of constitutional syphilis are the severe and even dangerous developments sometimes assumed by it after it has remained for several, or even for many, years latent in the frame. These cases present two difficulties — first, to estimate the influence of the poison in affecting the vital cohesion and conditions of the tissues in so permanent a manner as to render them liable to ulterior changes and disorganisation after very remote periods; — and *second*, to recognise the effects of constitutional remedies upon these vital conditions and consecutive changes, and to determine how much of these effects may be imputed to the operation of the means employed, and to the efforts of nature, or of the vital resistance opposed to successive changes. It is impossible for these difficulties to be overcome without a satisfactory knowledge of the various circumstances which thus tend to develop the constitutional infection, and to aggravate this infection into dangerous local disease.

118. Observation satisfactorily and extensively conducted will demonstrate that all depressing influences acting upon the body after infection has been produced will favour the supervention of the secondary upon the primary disease; and will even more remarkably develop the latent constitutional taint or contamination, wherever it exists, into active disease and disorganisation. Amongst these aiding and determining causes may be mentioned, anxiety of mind and fears of the consequences of infection; fatigue, debauchery, drunkenness, venereal excesses, unwholesome and insufficient food; want of sleep and sufficient repose; excessive exertion, exposure to extreme ranges of temperature; moist states of the atmosphere; and exposure to malaria in any form, more especially to miasmatous exhalations in hot countries. While these causes aid the constitutional infection in accelerating the changes resulting in local disorganisation, they also counteract the vital resistance opposed to these results, and throw down the barrier which the vital force raises for the protection of the organisation.

119. *C. Infection of the fœtus by one or both parents.* — *Congenital syphilis*, or the direct transmission of syphilis to the unborn fœtus, is a subject of considerable interest. That the syphilitic taint is more frequently in the father than in the mother appears manifest; but it is not so evident that the disease is conveyed directly from the father by means of the seminal fluid to the ovum, for the father may first infect the mother, the disease being afterwards communicated by her to the fœtus. Secondary syphilis, however, being a constitutional taint, like other constitutional taints, it may be transmitted to the offspring from either parent, in a more or less modified form. There can be no doubt also that secondary syphilis may be communicated to married women by their husbands without pregnancy having taken place; or even to them or to any one else by close contact, independently of sexual intercourse, when the circumstances stated above (§ 112.) favour the infection.

120. Dr. PORTER mentions the case of a lady, who had become pregnant three months before the father's first contraction of syphilis; and whose fœtus died within a week from birth of unmistakable lues. The circulation of the mother had therefore been poisoned at a considerable time subsequently to impregnation, although the father had never a sore capable of furnishing a drop of matter, and the mother never a symptom of any description, until an eruption appeared a few days before her delivery. Dr. PORTER believes, "that the semen of a diseased man deposited in the vagina of a healthy woman, by being absorbed, may contaminate that woman without the necessary occurrence of a chancre or any open sore secreting matter in either the man or the woman." Mr. HOLMES COOTE very correctly remarks (and his remarks bear out my own observations in a variety of cases) that "when the mother has once been infected with the syphilitic poison it becomes extremely difficult, if not impossible, to say when the taint will become extinct. The immediate effect, as regards the fœtus, is to cause its death *in utero*. As the poison becomes less virulent, the child is born with the disease and perishes in a few days or weeks. Then comes a class of cases in which the characteristic eruptions break out some weeks or even months after birth; but the exact limits of these periods have not been, and perhaps cannot be, accurately ascertained. In illustration of these remarks, I refer to the two following cases. In the first a respectable woman is infected by her husband. She is delivered consecutively of three dead children. At the expiration of thirteen years she gives birth to a living child which is covered by the usual eruptions shortly afterwards. In the second, a fine healthy-looking young woman is infected by her husband a few weeks after marriage. She is delivered of a dead child; after which she does not again become pregnant. But, eight years having passed, she suffers in her own person from the original taint." (*Op. Cit.* p. 129.)

121. Whilst I was physician to the Infirmary for Children, cases illustrative of the above remarks, as well as of the following statements, were occasionally brought under my observation. — 1st. That an infected mother may not communicate the disease to her infant. 2d. That an infected mother is very liable to transmit the distemper to the fœtus or infant. 3d. That the mother has been infected several, or even for many years, has given birth to one or more dead children, and has had at last a living child, which soon after birth presented the syphilitic cachexia, with anæmia, copper-coloured lepra, and ulcerations of the nose, mouth, anus, or genitals. 4th. The mother has had syphilis communicated to her by her husband; and the disease has disappeared, but she has been delivered of dead children; and after a number of years from the infection by her husband, the distemper has appeared in the throat and bones of the palate, or in other parts. 5th. The mother

has been the subject of syphilitic eruptions, &c., has been apparently cured; but after many years has had a return of secondary symptoms, and been pregnant, either in the interval or at a later period. The child when born, has been, and has continued in good health for several months or years, but has presented secondary symptoms subsequently. 6th. A woman has been the subject of secondary syphilis — of syphilitic eruptions, &c., and has communicated the distemper to the child given to her to nurse. 7th. Secondary syphilis in a child has been communicated to another child with which it has slept, the severer forms of secondary disease resulting. 8th. Secondary syphilis in a child has been by it communicated to its nurse, who has soon afterwards experienced the characteristic syphilitic eruptions, sore throat, alopecia, and other still more severe affections. 9th. A healthy woman has suckled, even for a few times, a syphilitic infant, and the secondary disease has been communicated to this woman, by this infant; she afterwards has suckled her own infant and given it the distemper.

122. These statements have been fully confirmed by my experience at the institution mentioned above, and in private as well as in gratuitous practice, during a number of years, and will readily be admitted by other experienced physicians. Indeed, they are fully confirmed by the writings of Dr. **Colles**, Mr. H. **Coote**, and by nearly all the old writers on syphilis. Dr. **Colles** remarks that the child may be infected after birth by a nurse suffering syphilitic ulceration of the nipple, or by its mother under the same circumstances, if the disease of her nipple has been derived from a strange child; but that no instance is known of a child infecting its own mother, although it will immediately communicate the malady to a strange nurse. The infection of the nurse by a diseased infant manifests itself by syphilitic affections which cannot be distinguished from that succeeding primary disease — by ulcerations of the throat, &c., by cutaneous eruptions, and by the formation of moist excrescences about the pudenda, which are capable of infecting her husband, in whom they are likewise followed by constitutional effects. In him the ulceration of the throat has not the same venereal character; it is superficial, and its surface is covered with patches of whitish lymph. Dr. **Colles** believes that the disease may be further imparted to other members of the family by contact, the use of the same utensils, &c., for it is remarkable, he adds, that its contagious property increases as it extends further from its source. Its symptoms, he states, bear an exact resemblance to each other in different individuals; and in this third remove from the source of contagion, it is permanently fixed in the parts it first seizes, and is of a much milder nature. If we compare the histories of the manifestations of syphilis in different ages, as furnished us by the most trustworthy writers down to **Oesterlen**, **Wallace**, and to still more recent authors, we are compelled to conclude that syphilis is one specific malady, that it presents various modifications resulting from modes of infection, race, treatment, and other influences; all its varieties being traceable to one stock or source.

123. *D.* **Inferences.** — As the result of observation and research, I conclude, — 1st. That syphilis, in the various forms and modifications it has presented in different ages and localities, is derived from, and hence originally identical with, the indigenous yaws of the native Africans. — 2d. That this identity or derivation is proved by the characters of both forms of disease, by modes of infection or contamination, by the susceptibility and unsusceptibility of both, as shown by inoculation [*], and by the same treatment being appropriate to both.—3d. That the indigenous African or Ethiopic syphilis was communicated to the Moors and Jews in the north of Africa, and thence conveyed into Spain, and probably also into France and the north of Italy, even before the discovery of America.—4th. That the distemper was further diffused and rendered epidemic or pestilential by the expulsion of the Moors and Jews from Spain by Ferdinand, towards the end of the 15th century, and by the distresses consequent upon this act; the miseries and the horrible sufferings resulting from it, as well as the diseases diffused by it, being recorded by contemporary writers.—5th. That this occurrence shortly preceding the invasion of Italy by Charles VIII. of France, by augmenting the sufferings and distresses of the inhabitants, increased the spread of the malady, and rendered it at the same time more virulent, acute, and fatal.—6th. That the diffusion, severity, and the infectious character of the malady were promoted by the distresses then prevalent in those countries, and for many years afterwards, by the prevalence of a leprous, or of a scorbutic diathesis in many, and by the habits and social conditions of communities, in those ages and countries.—7th. That there is sufficient evidence to conclude, that the disease existed as now stated, and had been propagated extensively, before the connate malady, the *yaws*, or *pian*, or *epian*, which was said to have existed in America when discovered by Columbus, could have been conveyed by his followers into Europe.—8th. That the manifestations of the distemper, usually described as varieties of it, — as yaws, epian, or as syphiloid diseases, or as pseudo-syphilis [†]; the chief of which are noticed above (§ 84. *et seq.*), are merely modifications of the malady resulting from modes or sources of infection, race, social conditions and habits, food and regimen, neglect of cleanliness, treatment, &c., as already insisted upon (§ 111. *et seq.*).—9th. That whatever lowers the vital forces of the economy, and more especially a combination of causes producing this effect, will favour the infection of syphilis, the development of the constitutional contamination, and the outbreak of the distemper when it lurks in the body.—10th. That the parent

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[*] The yaws are inoculated at an early age in many places in Africa, in order to prevent subsequent infection; and syphilisation is now practised in some places in Europe to prevent infection, as well as to produce a permanent cure of constitutional syphilis (see syphilisation in the sequel).

[†] **Sydenham** believed the yaws to be the same disease as syphilis. The writer of the article "*Epian*," in the "*Encyclopédie Méthodique*," has classed it, the yaws, and venereal disease as the same maladies. "*Epian.* Nom que les naturels de Sainte-Dominique donnoient à la vérole, qu'on croit avoir été endémique dans cette île. Quelques-uns ont cru que c'étoit un caractère de maladie plus grave et plus facheux encore que la vèrole; mais il est actuellement prouvé, que c'est la même maladie que les François ont appellé mal de Naples, et les Italiens mal François, chacun s'empressant de dèsavouer l'origine d'un mal aussi honteux, et accusant ses voisins d'en avoir propagé la contagion." (*Tome* vii. p. 2.)

tainted by syphilis will often, but not always, communicate the disease in a more or less severe constitutional form, with marked local affections, to the fœtus — with a severity often sufficient to destroy the life of the fœtus, either previously to or soon after parturition; and that, in many cases where the venereal taint has not been congenital, scrofulous diathesis or more manifest tubercular disease will result. (See §§ 82, *et seq.*) — 11th. That many of the circumstances and social habits which have been shown above to have favoured the dissemination and severity of syphilis for ages, after it was introduced into Europe, now no longer exist, excepting in limited localities; but when they have existed in more modern times, the distemper has presented a severity, and other characteristics displayed by it in former ages.—12th. That there is reason to believe that the disease existed in China from time immemorial, or at least ages before the period at which it became epidemic in Europe; but the extent, or the form, of its prevalence in that country at the present day I have not the means of knowing.* — 13th. That inoculation, as practised for ages on children by the negroes on the Gold Coast, for the prevention of yaws, and as lately had recourse to on the Continent against syphilis (see *Syphilisation*, §§ 155, *et seq.*), may be expected to lead to some important results.

123.* IX. Treatment.—i. History of. — It would appear, from the earliest writings respecting the discovery of America, that the disease existing in Hispaniola, when discovered by the Spaniards, was a variety of syphilis, if not the same distemper, or the same as the yaws existing at the same time, and for centuries previously, in Africa (see §§ 84, *et seq.*); that this disease was treated successfully by the natives of Hispaniola by the decoction of guaiacum; and consequently that guaiacum was employed by the Spaniards who had there contracted the disease. We accordingly find many of the early writers on syphilis, especially from the commencement to the middle of the sixteenth century, as De Hutten, Delgado, Ferro, Poll, Zene, Gallus, Michel, Ryff, Boncossus, Huschardus, &c., recommend guaiacum for its cure. Although a very few writers mention, towards the close of this century, mercury as a remedy for syphilis, yet it was not until the middle of the seventeenth century (1649) that Bonnjonnier asserted that this malady could be cured by mercury alone. Some years afterwards Mendez (1668) and Von Hammon (1674) proposed the question, whether or no mercury should be preferred to guaiacum in the treatment of syphilis? Since then, and especially from the commencement of the eighteenth century until the beginning of the nineteenth, mercury has been the almost universal remedy for this distemper; and corrosive sublimate was the most employed preparation of it; more than one hundred writers (117), during the eighteenth century, alone recommending it. Cieza and Blancard prescribed sarsaparilla; the former stating that this medicine was adopted by the native Peruvians for the cure of syphilis, as it prevailed among them; and numerous Spanish and Portuguese writers in the sixteenth and seventeenth centuries employed it, in conjunction with guaiacum and sassafras; this combination being very generally resorted to as a part of the treatment of syphilitic cachexia down to the present day.

124. Early in the eighteenth century, Willoughby (*Salivation shown to be of no use or efficacy in the cure of the Venereal Disease*, 4to. Lond. 1723) contended against the practice of salivation, then so generally adopted; and in 1779, Cockburn affirmed that all venereal ulcers will heal under a local treatment merely; and that mercury should be resorted to only when constitutional symptoms appear. Early in the present century several army surgeons, probably instructed by their observations in Spain and Portugal, where the practice followed before the general introduction of mercury still lingered, proclaimed the treatment of syphilis without mercury; and from 1820 to 1830, experiments were made in the Hospitals of Sweden — a country where scientific progress is always in advance — and in Hamburgh, on the non-mercurial treatment of this distemper. In the present day there can be no doubt of the success of this treatment in the majority of cases; and that the worst states of the disease — the most prolonged and most dangerous forms — have been those, for which mercury had been most abundantly employed at an early stage, and the most copious salivation produced and continued for the longest periods.

125. In the summer of 1825 the iodide of potassium was first prescribed by me for the cure of secondary and tertiary syphilis, and the prescriptions were then prepared by Mr. Morson, the well-known operative chemist, who also about the same time prepared for me an iodide of sulphur, in order to employ it in similar cases; but I soon relinquished the internal use of the latter for the former, as being, even in small doses, too irritating to the digestive mucous surface. In the following year, I had recourse, in the case of E. L., Esq., M.P., to the use of iodine. This case, the nature and history of which was well known to Mr. C. Beevor, of Upper Harley Street, had been treated unsuccessfully by mercury in every conceivable form and combination; and when it came under my care I viewed the severe symptoms, which were seated chiefly in the large joints, as the result of the combined effects of syphilis and mercury. Iodine was had recourse to successfully in this case. The correspondence between this gentleman and myself respecting the treatment during his absence from London is still preserved by me in proof of the early and successful employment of iodine and its preparations for secondary and tertiary syphilis.

126. Since 1825 I have prescribed these preparations, whenever I have been consulted in cases of this nature; but in some, and in certain stages and states of the disease, they have failed, as in two instances which lately came before me.

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* My relative, Mr. Pottinger, who passed some time in China, informed me that syphilis appeared to be a disease of great antiquity in that country; and that the primary sores caught by Europeans from Chinese females generally assumed a phagedænic or sloughing character. The constitutional affection rarely occurred. He states in answer to my inquiries, that the disease appeared indigenous to the country; that secondary symptoms are not more frequent among Europeans in China than elsewhere; that the phagedænic form of chancre was very common, but the round indurated ulcer was often met with, and was extremely obstinate; that as the phagedænic sore progressed towards a cure, much hardness appeared about its edges; and that it was *then* necessary to make the gums slightly tender in order to heal it up completely.

and which I remitted to the care of Mr. H. Lee, for the employment of his plan of mercurial fumigation. Most of the severe and dangerous cases of syphilis which I have had an opportunity of witnessing have been reduced to this state by an excessive or an improper use of mercury; and it has been more especially in those cases that the use of iodine, especially the iodide of potassium has been most successful. The worst symptoms which have been too frequently ascribed to local manifestations of syphilis, especially affections of the periosteum, bones, &c., have been demonstrated to me to have been the results of excessive doses of calomel alone, very commonly given in hot countries, during the early part of the present century, for the cure of fevers. At one period it was attempted to bring the system under the influence of mercury in these maladies, but the practice very generally failed; and in some of these cases, in which recovery took place, disease of the periosteum was the result.*

127. ii. Treatment of Primary Syphilis — *A*. The *intensions* of cure in this stage of syphilis are, — 1st. To destroy the poisonous ulcer, and heal the part as soon as possible,— and 2d. To prevent the contamination of the constitution. The *first intension* is best accomplished by touching the sore with nitric acid, nitrate of silver, or any other escharotic. The penis may afterwards be wrapped in a rag dipped in warm water. An aperient may also be given, and rest and low diet enjoined. If the sore have lasted above a week, it may still be expedient to destroy it; but there will not be the security against constitutional contamination, which an earlier recourse to these means might afford. When, however, the chancre consists of a well-marked indurated lump, or when the penis is swollen and inflamed, the patient feverish, or when there is swelling or tenderness in the groin, then the above local treatment is no longer applicable'; and mild liquid applications, consisting of the black wash, lotions containing tannin or catechu, or of other substances capable of decomposing the contaminating secretions, may be prescribed to the affected parts. If there be much irritation, the penis should be enveloped in a poultice, or in a fomentation of boiled camomile flowers and poppy heads, and the patient kept in bed. If induration exist, an ointment with calomel may be applied. "Afterwards, during the indolent and granulating stages, the sores may be treated with any astringent lotion, and be touched occasionally with nitrate of silver, or sulphate of copper." (Druitt.)

128. *B*. The *prevention of the constitutional contamination of syphilis* was formerly attempted by a recourse to mercury contemporaneously with the treatment of the primary sores, the belief being general that where this object was not attained by means of this substance, the disease would infallibly proceed from bad to worse. Had however, the malady been studied with a due reference to its origin and to its treatment, during the earlier periods of its history, as well as to the treatment of the connate malady, of which I have contended that it is merely an extension and modification, a different method of cure would have been instituted; and a recourse to mercury would have been either reserved, or entered upon in such a manner, and with such precautions, as would have secured successful results. The modern opinion, however, is, that every case of primary syphilis *may be* treated without mercury; that the too profuse administration of it may render the disease infinitely worse; that there are many cases which do not admit of it at all; but that in the right cases the moderate and judicious use of mercury removes the existing symptoms and renders the patient far less liable to a relapse.

129. Mercury is either not required or not admissible under the following circumstances:— "When the primary sore has been destroyed, or has healed within seven days from its commencement; when it is much inflamed, irritable, sloughing, or phagedænic; when the patient is feverish and irritable; when a bubo is present; when the health or constitution has suffered from attacks of syphilis or the use of mercury; when mercury is known to cause rapid salivation, or to occasion loss of flesh, sore throat, night sweats, or mercurial erethism; and when scrofulous disease is manifestly pronounced, or when tubercular consumption is fully developed. If there be more of these contra-indications, and more especially if the sore be indurated, mercury may be given; not because absolutely necessary to a cure, but because it has been proved by experience to hasten the cure of the primary, and to lessen the chance of secondary symptoms." (Druitt.)

130. But, as Mr. H. Coote has justly stated, "every form of primary syphilitic disease may be followed by constitutional affections, the nature and the duration of which no one can predicate," whether the treatment be mercurial or non-mercurial. The want of fixed opinions as to the treatment of the disease displays itself in all the countries of Europe; and although it causes much uncertainty and distrust of the use of remedies, the injurious recourse to the excessive use of mercury, so common in former times, is no longer adopted. The most important question, however, is the frequency of constitutional disease after primary syphilis, when treated with, or without mercury, for the primary affection is, in by far the greatest number of cases, an evil of comparatively little magnitude. Secondary syphilis, when once established, is a disease of which no one can foretell the termination. Its various phases, their succession and complication, are almost beyond the reach of our knowledge, and often out of the

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* The following interesting case illustrates this fact: it occurred more recently than the period above referred to. Some years ago, a gentleman trading to the west coast of Africa was attacked by fever, and was treated by calomel given in scruple doses every three or four hours. He recovered from the fever, and returned to England. I was called to see him soon afterwards, and found him completely hemiplegic, with two large swellings of the pericranium. Having heard the account of his case, that he had never any venereal symptom, primary or secondary, that he had taken an excessive quantity of calomel during the attack of fever, I inferred that a tumour of the dura mater, as well as of the pericranium, had resulted from the calomel, and now pressed upon the brain. The iodide of potassium was therefore prescribed, and he rapidly recovered the use of his side, the paralysis disappearing with the subsidence of the pericranial tumours. He has continued in good health up to this time.

Whilst this was passing through the press I was called to a lady similarly affected to the above case, after the prolonged use of mercury for hepatic disease. The iodide of potassium has already been very beneficial to her, but sufficient time is not yet elapsed to show the full results.

sphere of treatment. Dr. **Hennen** treated 105 cases of primary sores without mercury; secondary symptoms followed in eleven instances, and all these were cured without mercury, excepting one obstinate case. In the report of the Army Medical Department from December 1816 to December 1818, 1863 cases of primary chancre were cured without mercury out of 1940 cases, ninety-six having had secondary symptoms; the average time required for their cure being twenty-one days, when bubo did not exist; and forty-five days when bubo was present. The average time for the cure of secondary symptoms without mercury was from twenty-eight to forty-five days. In the above period, 2827 cases of primary affection were treated with mercury; secondary symptoms occurred in fifty-one of them. The average time for the cure of primary symptoms without bubo was thirty-three days; with bubo, fifty days; and for the cure of secondary symptoms, forty-five days. Of two cases treated by Mr. **Green** without mercury, buboes occurred in sixteen cases, six only suppurated; and constitutional disease, preceded by febrile symptoms, followed in nine cases.

131. From these data, it will be seen that the balance of advantages is not much in favour of mercury; and yet there are a few cases which cannot be cured, or at least not so soon or certainly cured, without this mineral, when used in a judicious manner. The opinions of some of the ablest recent writers as to the use of mercury for primary syphilis appears to accord with those of H. **Lee**, **Druitt**, and **Acton**; and upon the whole with the results of my own experience, which agrees also with the following remarks by Mr. **Holmes Coote**: "I am far," he states, "from undervaluing mercury as a remedy in syphilis; on the contrary, it is the most certain and powerful remedy we possess; but it requires to be administered with caution. The best method of securing a patient against the invasion of secondary symptoms is by destroying the primary sore, when small and manageable, by caustic; next, by healing the primary sore when that measure is impracticable, as quickly as possible, without detriment to the patient's health. If we salivate a patient in whom a small superficial sore is running its usual brief course of two or three weeks, we positively do the man an injury. But if induration should occur, either in the base of the sore as in the indurated chancre, or in the cicatrix, a course of mercury, judiciously administered, is invaluable." The rules which should guide the treatment of chancres, are,—1st, to destroy, as rapidly as possible, the syphilitic virus, by applying the nitrate of silver, the strong nitric acid, or the acid nitrate of mercury, or the Vienna paste, to the sore when it is small, and spreading, but without induration;—2d, For sores which are not indurated, spread feebly, and show signs of incipient granulation, the administration of mercury is injurious, as retarding the healing process, and not protecting the patient from secondary symptoms;—3d. When induration exists in the slightest degree in or around the sore; when the chancre continues to spread quickly, or when, after seven days, it shows no disposition to heal, then mercury is required;—4th. Mercury is either inadmissible, or not required, or even dangerous, for phagedænic and sloughing chancres, and in the other circumstances above noticed (§§ 129.);—5th. The longer a syphilitic sore continues unhealed and secreting the contaminating matter, the greater the risk of constitutional infection;—6th. The more robust the constitution, and the more perfect the general health, the risk of secondary symptoms from primary sores appears diminished: but this vital resistance to contamination should not prevent the early cure of chancre, more especially when it is indurated, nor prevent a recourse to mercury if the sore has been neglected or of long continuance.

132. Having determined, after due consideration, to have recourse to mercury, the selection of the preparation and mode of exhibiting it require some attention. The preparations which are most suited to the primary disease, when there is no bubo, are the hydrargyrum cum creta and calomel, and in some cases the pilula hydrarg. chloridi composita. The other preparations of mercury, especially the mercurial ointments and the bichloride are more beneficial in other states of the distemper. The dose, and frequency of exhibiting the hydrarg. cum creta or calomel, require no remarks. They should be regulated according to the state of the patient, and their effects upon the bowels. Calomel generally requires to be conjoined with small doses of opium, or with the pilula saponis composita, but in this latter combination the dose of calomel should be much increased. The object is to produce a slight soreness and sponginess of the gums, with a very slight salivation when indurated chancre exists, and to continue it for four or five weeks, preferring in the latter case the longer period. The dose of the medicine should be regulated according to its effects. During this course, the regimen of the patient should in part depend upon his state of health when commencing it. He should live regularly but not too low. If he be in ill health in other respects, the treatment, and regimen, and diet suited to his state should be prescribed. In general, excesses in food and wine should be avoided, and whatever is calculated to disorder his digestive and biliary organs. The clothing should be warm; and fatigue, cold, wet, the morning and night air ought to be carefully avoided. If, notwithstanding this attention to health, and to the prevention of disorder, any of the indications described, when treating of the injurious effects of mercury, make their appearance, the means recommended for their removal, in the articles **Erythism, Mercurial**, and **Poisons** (§§ 562, *et seq.*), should be employed.

133. C. *Gangrenous chancre*, when it occurs in strong, sanguine, plethoric, or healthy persons, is usually the result of excessive inflammatory action, and requires large vascular depletions, free purging, and afterwards opium conjoined with salines, antimonials, &c. Locally, poppy fomentations, poultices with balsam of Peru, or with turpentine, after the nitric acid lotion, will detach the sloughs. If the ulcer which remains is healthy, and heals, there is no need of mercury; but if it ulcerates, independently of the state of the general health, or if secondary symptoms appear, mercurials should be directed. *Sloughing*, *gangrene*, and *phagedæna* of venereal sores are, however, most frequently consequences of an exhausted or broken-down constitution, from intemperance or other

causes. In such cases, the application of opiate and camphorated lotions to the sore, of strong nitric acid, if it spread; and opium and camphor, or ammonia, the fixed alkalies and tonics taken internally, aided by a generous diet, beef-tea, wine, &c., are indispensable.

134. *D. Phymosis* is sometimes caused either by *balanitis*, or by one or more ulcers under the prepuce. In these cases there is more or less discharge. A chancre is often detected by local hardness and tenderness. If the prepuce be elongated, and cannot be retracted, circumcision may be advisable; but generally it will be sufficient to split the prepuce so as to enable the parts underneath to receive due attention, and the treatment which the character and progress of ulceration may require. The frænum is not unfrequently perforated by a chancre; and it then requires to be divided. In the circumstances now stated, the duration of the chancre, and the confinement of the secretion under the prepuce increases the risk of constitutional contamination, and requires, unless in very recent cases, a recourse to mercury. A chancre in the urethra requires astringent injections, preferably such as contain the bi-chloride of mercury, and a course of this mineral if not contra-indicated by the state of the patient.

135. iii. The non-mercurial Treatment of primary syphilis may be adopted in the circumstances above stated (§§ 131, 132.), or even in others where it may be considered prudent or advisable to have recourse to means which will improve the general health, and enable the constitution to resist the invasion of the poisonous virus. If there be debility or impairment of the digestive and assimilating functions, tonics, the chalybeates; the preparations of cinchona, or of sarsaparilla, or of guaiacum; cod-liver oil, simple or medicated; the compound decoction of sarsaparilla, with or without iodide of potassium and liquor potassæ, will be found the most deserving of confidence, especially if prescribed appropriately to the circumstances of the case, and if the patient live regularly, and avoid intemperance of all kinds, and all causes of vital exhaustion. (§ 118.)

136. iv. Treatment of Bubo.—Mr. H. Coote states that he knows of no relation between the occurrence of bubo and the frequency of secondary syphilis; and he believes the idea that a copious suppuration from the groin eliminates the venereal poison to be unfounded. "When swelling of the glands occurs in conjunction with primary syphilis, or is supposed to depend upon the syphilitic poison, mercurial frictions are directed upon the thighs, that the mineral may pass through the enlarged parts." In more chronic enlargements, the swelling may be covered by a plaster of the unguentum hydrargyri, or of the unguentum ammoniaci cum hydrargyro. "Leeches are not often required to an inflamed bubo, but they may sometimes be applied with advantage." The existence of suppuration should not suggest an early recourse to the lancet, as absorption often takes place after the skin has become red or even thin. Absorption of the matter from suppurating buboes does not add, in Mr. H. Coote's opinion, to the patient's danger of secondary syphilis. An opening, when required in a suppurating bubo, should always be made in the long axis of the thigh. If any burrowing of matter occur, particularly in scrofulous persons, who are most liable to buboes, tonics, with a restorative and digestible nourishing diet, are required.

137. The treatment advised by Dr. Druitt and Mr. H. Lee, for bubo is very different from that now stated. The former writer remarks that the first indication is to produce resolution of *acute* bubo—"by rest, aperient and saline remedies, low diet, leeches and fomentations. The applications to the chancres must be soothing, and mercury, if being administered, should be at once given up. As soon as the tenderness is relieved, pressure by means of a compress and bandage, or by placing a weight on the part as the patient lies in bed, is useful. Even if matter does form and does not seem inclined to come to the surface, the iodine paint, cold lotions, aperients, tonics, and pressure will sometimes cause it to be absorbed. But if it increases, and the skin becomes inflamed and shining, a puncture should be made, and the case be treated as any other acute abscess." The chief circumstance deserving notice in this quotation is the abandonment of mercury if it have been already prescribed. My observation in former days has induced me to agree with Mr. H. Coote in a recourse to mercurial inunctions on the thighs, as they produce "a complete effect upon the constitution, and may be used with advantage in cases of chronic bubo, combined or not with primary disease." Suppurating buboes, or solid inguinal swellings, will often disappear under this treatment, which, to be effectual, he advises to be done in the following way:—"The patient sitting before the fire, should rub on the skin at the inner part of the thighs a drachm of the strong mercurial ointment every night, or every night and morning. He should slip on a pair of drawers and go into bed, that the absorption of all that which stains the skin may go on. The patient should not be allowed to wash the part except at intervals, to prevent the skin from being chafed." The introduction of a drachm or two of mercurial ointment into the axillæ when in bed will generally produce the mercurial action when it is required in other circumstances.

138. In cases of *indolent bubo*, the indication is to improve the general health, by sarsaparilla, tonics, and the other means advised above (§ 135.). For these, change of air, sea voyaging, removal to a warm and dry locality, and digestible food are the most beneficial means of cure. The local use of iodine is sometimes of service both in these and in the chronic enlargements of the inguinal glands, but it is not so beneficial as the internal use of the preparations of this substance, which. when used internally, should be combined with either the liquor potassæ, or with either of the carbonates of potash, and be prescribed with other suitable medicines. If *sinuses* form, or if *sloughing* or *phagedæna* occur, or if the ulcers become *irritable* or much inflamed, the means suitable to the case, both internal and external, should be employed.

139. v. Treatment of Constitutional Syphilis. — *A. Of secondary affections.* It has been contended by some recent writers and stated above (§ 46.), that the simple and phagedænic sores are rarely followed by constitutional syphilis. whereas the indurated chancre rarely if ever fails to be succeeded by the secondary disease. Mr. H. Coote disputes these positions, and concludes

that secondary symptoms in large proportion ensue after every variety of simple and non-indurated chancre. After primary phagedæna, too, secondary symptoms may be dreaded, and no lapse of time seems to render the patient's constitution free, the secondary disease partaking of the character of the primary sore. "If a person were to have a well-marked phagedænic ulcer, I would not guarantee his not suffering phagedænic ulceration of the throat after an interval of ten years, or even more." Mr. COOTE adds, that no one who has primary syphilis in any or in its slightest form can be safely guaranteed from the occurrence of constitutional disease; but if six months elapse after the healing of the primary sore, the patient remaining well, the chances are greatly in his favour that he will escape any further disease. An exception, however, must be made in the case of primary phagedæna.

140. It is often necessary to disabuse the patient's mind of the belief that the syphilitic poison may be destroyed by some specific, which will enable him to revert to his former habits. All, however, that can be done, is to combat the disease as it appears, and to point out those modes of living which may prevent, although they cannot procure complete security from the constitutional infection, or certainly remove the contamination when it has already been produced. Much depends upon the patient himself, in respect of the amount of protection which may be afforded him. For anxiety of mind, gloomy ideas, and all irregularities and excesses, and the other concurring causes mentioned above (§§115—118.), will perpetuate the constitutional contamination, and develope its local manifestations, and induce a state of syphilitic cachexia.

141. If venereal eruptions, sore throat, &c., be ushered in, as they often are, by febrile or inflammatory symptoms, aperients, salines, and antimonial diaphoretics will be of service. The diet should be restricted, the patient confined to the house, and the warm bath often resorted to. "When the febrile state has vanished, if the patient has never taken a course of mercury — or if he have been subjected to an imperfect course of it for the primary symptoms — and his constitution is sound, he may take mercury as already directed. If under its use, the strength and general appearance are improved, so much the better; but if the patient gets thinner, weaker, and haggard, and suffers from chills and feverishness, or if his ulcers become irritable and phagedænic, it must be given up. The mercurial vapour bath, or the corrosive sublimate in very small doses, and not carried to the extent of affecting the mouth, will often be of great service when the full course of the mineral is inapplicable." (DRUITT. *Op. cit.* p. 189.) The numerous authorities in favour of the bichloride [*], and my own experience of its effects, have rendered me partial to the adoption of it, in preference to other preparations, when a recourse to mercury should be had.

142. The iodide of potassium is often of great service, especially when a recourse to mercury is considered inexpedient or improper (§ 129.); or after mercurial remedies have been prescribed without a satisfactory result, or when they appear to have been injurious. It is in these latter circumstances, and especially where a protracted course, or a too liberal exhibition of this mineral, has been directed, without avail, that the preparations of iodine, especially the iodide of potassium, in due solution and combination, according to my observation, have been most beneficial.

143. The preparations of sarsaparilla, especially the compound decoction, are always productive of great benefit. They may be prescribed either subsequently to a course of mercury or of iodine; or the bichloride of mercury, or the iodide of potassium may be taken with the compound decoction of sarzæ, or with the fluid extract or syrup. In some states of secondary syphilis, the muriate or the nitrate of ammonia may be taken in tonic and aromatic infusions, in as large doses as will not offend the stomach; or the nitro-muriatic acids may be tried, either in weak dilutions or in the infusions just mentioned. But in most cases of secondary syphilis, characterised by much debility and loss of flesh, or by anæmia, few means are so generally useful as a prolonged course of the bichloride of mercury in the tincture, or compound tincture of cinchona, in the proportion of half a grain or a grain to the ounce of the tincture, a drachm, or a drachm and a half being taken twice or thrice daily in a little water, according to the circumstances of the case. When the throat, palate, or other parts of the mucous surfaces are much affected, this combination, or the bichloride in the syrup or fluid extract of sarzæ, aided by gargles containing the bichloride, or by mercurial fumigation, is very frequently efficacious.

144. In cases of indurated chancre of considerable duration, in most cases of secondary syphilis, and generally in tertiary syphilis, analyses of the blood demonstrate a great diminution of red corpuscles, an increased amount of albumen, the fibrin not being materially altered in quantity. These results should not be overlooked, as they indicate the propriety of caution in the exhibition of mercury, and of selecting the mode of exhibiting it now advised; or of adopting the preparations of iodine, and especially the iodide of iron, prescribing it in the syrup of sarsaparilla.

145. During the treatment of constitutional syphilis it should always be kept in recollection, that whatever depresses the vital force, or impairs the general health, favours the developement of the syphilitic contamination and its external or local manifestations: and that, if the remedies resorted to produce these effects upon the constitutional energies, they will very probably prove more injurious, than beneficial. Hence the remedies should be so combined, exhibited, and alternated; and so aided by a regulated diet, and by a

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[*] Dr. DZONDI, Professor at Halle, prescribes the bichloride as follows: — ℞. hydrarg. bichloridi gr. xij.; solve in aquæ distillatæ q. s. et adde micæ panis, et sacchari albi, āā, q. s. ut fiant pilulæ cc., sing. gr. j. The pills are to be rolled in powdered Canella bark; and on the first day four pills are to be taken (¼ of a grain); on the second day none; on the third day six pills; on the fourth none; on the fifth eight pills; on the sixth none; on the seventh day ten pills, and so on, until the twenty-seventh day, when thirty pills are to be taken (1¾ grain). The treatment is then complete; but in some instances of severe secondary symptoms they are to be carried even further. The pills may be taken on a full meal. Sarsaparilla is also to be taken during the course, or even afterwards. Also animal food is to be reduced to one half the usual quantity; and pork and bacon avoided. The cold night and morning air, and cold and wet are to be shunned. I have been consulted by patients for whom this treatment has been adopted; but the cases have been too few to admit of an opinion respecting it. It is merely a modification of the well-known treatment advised by VAN SWIETEN.

healthy, temperate, or warm and dry atmosphere, as to promote the constitutional powers; improvement in the healthy appearance of the patient generally indicating the success of the medicine employed.

146. B. *The local treatment* of secondary syphilis consists chiefly of warm, vapour, or sulphur baths, for the eruptions; of the application of lotions of corrosive sublimate, or ointments containing the unguentum hydrarg. nitratis, or the unguent. hydr. præcipitati albi, especially when the eruptions are severe, or are leprous or tubercular. If itching or irritation be experienced, lotions or frequent sponging the parts with a saturated solution of the biborate of soda in any emollient fluid will generally be of much service. Dr. Druitt states that "for the common excoriated sore throat, any soothing detergent gargle will do. When there are ulcers, it is advisable to use gargles of corrosive sublimate; and when the ulcers are indolent they may be touched with the linimentum æruginis. Mercurial fumigation is also occasionally of benefit. It is effected by putting a scruple of red sulphuret, or of the common black oxide, or twice the quantity of mercury with chalk, on a heated iron, in a proper apparatus, and inhaling the vapour,—a heated penny piece in a tea-cup will answer the purpose.[*] When a foul ulcer is seated in the velum, or roof of the mouth, or pharynx, or alæ nasi, an attempt may be made to check its ravages, by destroying its surface and edges with acid nitrate of mercury." (*Op. cit.* p. 190.). The ulcerations at the roots of the nails, or between the toes, are cured by the internal administration of mercury, and the application of a solution of nitrate of silver,—from four to ten grains to the ounce of distilled water. When the hair falls off the scalp, the hair should be kept short, and the dilute ointments, just mentioned applied, or the means resorted to which are advised in the article on the Hair (§§ 32, *et seq.*).

147. Mr. H. Coote remarks that the common warm bath effects but little in comparison with the Turkish bath, which is admirably suited for the chronic stages of secondary syphilitic eruptions[*], and which may now be procured in London. Extremes, or even alternations, of temperature should be avoided; and the regimen and diet should be regulated according to the habit of body, the usual modes of living, and the peculiarities of the case, avoiding too great abstinence on the one hand, and too full living on the other; moderation in all things being always observed.

148. vi. The Treatment of Tertiary Syphilis.—In this state of constitutional contamination, mercury, if exhibited at all, should be prescribed with great caution, and it ought not to be given if it have been previously resorted to, either in prolonged courses, in large quantity, or in such a manner as to occasion copious salivation, or any of the more unpleasant effects, described in the article Poisons (§§ 562, *et seq.*). But if the patient have not had recourse to this mineral in any form, if none of the more severe tertiary affections exist, the bichloride of mercury may be prescribed in full and increasing doses in the compound decoction of sarsaparilla upon a full meal, or as advised by Van Swieten, or mercurial fumigations may be resorted to. But if a manifest improvement in health, and in the local affection, in a reasonably sufficient time be not observed, or if there be any aggravation of symptoms from this treatment, the iodide of potassium should be substituted, and given in doses of three grains thrice daily, increasing them to five grains conjoined with the liquor potassæ, or with

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[*] Mr. Henry Lee has given (*Transact. of Med. Chirurg. Society of London*, vol. xxxix. p. 339.) the following directions as to the use of mercurial fumigations:—

"Finding from experience that it was the light-coloured oxide alone which volatilized, and produced its effects upon the patient's constitution, and having reason to believe that the light colour depended upon the presence of calomel, I performed a series of experiments with calomel alone, or mixed in a certain proportion with the grey oxide. The general result of these experiments has been, to satisfy me that, for the purposes of mercurial fumigation, five or ten grains of calomel alone is, in ordinary cases, quite sufficient; and that when the grey oxide is used, the admixture of a few grains of calomel will facilitate its sublimation and insure its medicinal action."

"Upon making comparative trials with calomel alone and combined with steam, it was found to act more certainly and with greater irregularity in the latter case.

"The plan which I have adopted is very simple. Two small lamps are procured in which the methylated spirit (much cheaper than spirits of wine) is used; over the first lamp is a thin metallic plate, upon which the ten grains of calomel are placed; over the second lamp is a small cup of hot water. A small cane-bottomed chair is placed over the lamps, and the patient sits upon it. He is then enveloped, chair and all, in a blanket; at the expiration of a quarter of an hour or twenty minutes he rolls himself up in the blanket and goes to bed.

"For patients to whom it may not be convenient to procure the spirit lamps, the mode of proceeding may be varied as follows: The patient is directed to heat a thick tile in the fire; this is then put into a night stool, and a gallipot full of warm water placed upon one corner of it. The calomel powder is then sprinkled over the rest of the tile, and the patient sits over it, being enveloped, as before, in a blanket. This mode of applying the vapour is very convenient in cases of affections, either primary or secondary, of the generative organs. It is not necessary in either case that the patient should breathe the mercurial fumes. It is remarkable how soon the patients' systems are brought under the influence of the mercury by this simple means; and, according to my experience, how effectually it acts in cases both of primary and secondary syphilis. Its great advantage, however, consists in the very little constitutional disturbance produced, and in the avoidance of those symptoms of irritation and debility, both mental and physical, which the prolonged internal use of mercury is so apt to occasion. The mercurial action, when the medicine is introduced through the skin, may be continued for nearly any length of time that may be necessary; and may be repeated as often as may be convenient, without injuring the patient's constitution.

"The small quantity of calomel which it is requisite to use at each fumigation, is probably one reason why mercury in this form may be used with such comparative impunity."

[*] Mr. Coote describes this bath as follows:—The clothes having been removed, and a suitable bathing dress supplied, the bather is conducted into a heated apartment, where he is allowed to sit and accustom himself to the increase of temperature. During this time the body becomes covered with a tolerably profuse perspiration. Next he is conducted to another apartment, where there is a higher degree of heat (115° F.), and the atmosphere is charged with watery vapour. There he reclines on a heated marble slab, and undergoes a slow process of shampooing. The quantity of cuticle that peels off surprises one who has not witnessed the process; but the skin is left in a cleaner state than perhaps it had been in for years. After the movements of the limbs have been tested in a variety of ways, the bather is conducted to a recess, in which is a fountain with hot and cold water, where he may apply soap and hot water as his taste dictates, or have the process performed by an attendant. A feeling of langour, not by any means unpleasant, supervenes, which renders a short period of repose on a couch agreeable. This process removes a large quantity of cuticle from the integument, causes the blood to circulate through the minute capillaries, and brings into activity the sudoriparous and sebaceous glands. We may, I presume, infer that without the proper performance of these functions, the skin is not in a healthy state; and that any morbid condition, such as lepra or lichen, would be materially benefited by rousing them into activity." (*Op. cit.* p. 108.)

either of the carbonates. In cases where mercurials have been freely employed, and especially where there is reason to infer that the affections of the periosteum or bones has been caused or aggravated by these medicines, or where there is doubt whether or no any of the tertiary affections have been caused as much by mercury as by the distemper, the decided use of the iodides of the fixed alkalies is generally the most beneficial. In cases manifesting more or less anæmia (See §§ 143, 144.), the courses of iodides, and still more those of mercury, should be followed by a course of the iodide of iron taken in syrup of sarsaparilla.

149. If the periosteum or bones be diseased, still greater caution in having recourse to mercury is required, although in strong constitutions, and where mercury has not been previously given, full doses of calomel and opium, or of these with camphor, will often initiate the treatment with benefit, and they may be continued or modified as long as they continue of service, and afterwards the iodide may be prescribed, increasing the doses until success result from it. I have generally prescribed this medicine in the following combinations.

No. 378. ℞ Potassii Iodidi ℈j. ad ℈ij.; — Liquoris Potassæ ʒij. (vel Potassæ Bi-carb. ʒij.); — Tinct. Aurantii (vel Cascarillæ) ʒvj.; — Extr-fluidi Sarzæ ℥jss; — Infusi Gentianæ Comp. ad ℥viij. *M.* Fiat Mist. cujus Capiat Cochl. ij. vel iij. larga, ter in die in aquæ cyatho amplo.

150. It will generally be of service to take the iodide in weak solutions, even when it is prescribed in the largest doses. If it relax the bowels, a few drops of tinctura opii, or a little tinctura camph. comp. may be added to each dose: or, the iodide and the alkalies may be taken in the compound decoction of sarsaparilla, to which a tonic or aromatic tincture, or an opiate, may be added, according to circumstances. When this remedy succeeds in removing the venereal affection, it should be continued for some weeks afterwards, gradually diminishing the dose. In some cases it causes irritation of the mucous surface of the throat, nostrils, and eyes, with a copious defluxion, or pains at the region of the stomach, or irregular febrile symptoms. These disorders are observed especially when the iodide has been given in too large doses, or uncombined with the carbonate or solution of potash. When taken thus uncombined, the acid in the stomach decomposes the iodide and the free iodine irritates the mucous surfaces.

151. In cases of ulceration of the pharynx, or larynx, or of disease of the bones, of the palate or nose, mercurial fumigations may be first tried, if mercury has not been already employed; but care should be had not to allow it to affect the mouth. Sarsaparilla, with a cautious use of the iodide of potassium and sedatives; the application of a strong solution of the nitrate of silver, or of the bichloride of mercury to the ulcerated surface, and of terebinthinate embrocations to the throat externally, are often beneficial. Gargles containing either the bichloride or the iodine, neither of these substances being in such quantity as to occasion much irritation of the throat, may also be tried. In all these the utmost attention and care are required. When tuberculated or other eruptions assume the characters of open sores or ulcers, the simple or compound tincture of iodine will be most advantageously applied to them, in modes and in degrees of dilution varying with their appearances.

152. When nodes are formed, the pain and consequences which often result, require iodine, alkalies, sarsaparilla, and opiates, with light nutritious diet, residence in a warm and dry air, and blisters over the affected parts. The blisters often should be repeated, in order to prevent, by the external discharge, the inflammation from extending to, or disorganising the osseous structure. If mercury have not been employed, the blistered surface may be dressed with strong mercurial ointment, and either with opium, or morphia; and the diet and regimen duly regulated, with strict reference to the several peculiarities of the case, to the extent to which the general contamination and cachexia may have advanced, and to the state of the local affections.

153. vii SYPHILIS IN INFANTS AND CHILDREN. — The treatment should be directed not merely to the infant or child, when the state of either admits of any hope from treatment, but more especially to the parents. For these as well as for the child, a mercurial course, if not previously had recourse to, should be prescribed: and in the majority of cases, the bichloride of mercury, exhibited as above (§§ 141.) or combined with either of the tinctures of cinchona, will be found the most efficacious. Subsequently the iodide of potassium or iodide of iron and the preparations of sarsaparilla may be employed, according to the peculiarities of the case, more especially if anæmia be very manifest. It has been recommended for children to rub ten grains of mercurial ointment daily into the axilla or soles of the feet, or to administer half a grain or a grain of hydrargyrum cum creta every night until the symptoms disappear. But the disease is not so completely eradicated by these means as by a judicious exhibition and management of the bichloride, especially when followed by the means just named, varying the dose, and the vehicle in which it is prescribed, with the age and circumstances of the case.

154. X. SYPHILISATION, *or the inoculation of syphilis*, has recently attracted attention not only as a cure, but as a prevention of any future occurrence, of the distemper.—i. HISTORY.—M. AUZIAS TURENNE first proposed this startling mode of treating and of preventing syphilis in 1850, by bringing it before the French Academy of Medicine. This young physician commenced, about 1844, a series of experiments with the view of testing JOHN HUNTER's doctrine of the non-communicability of syphilis to the lower animals. After many experiments and some failures, he succeeded in producing in monkeys, inoculated with chancre-matter, a true chancre, and the disease thus communicated to them was transferred to rabbits, cats, and horses. "The malady was again returned by inoculation from these to the human species, the first trials in this regard having been made by Dr. ROBERT WELTZ, of Wurzburg, on his own person. On four separate occasions Dr. WELTZ succeeded in producing an unmistakeable chancre on his own person, by inoculation from animals, and this was acknowledged even by RICORD."

155. This discovery, as stated by Dr. RADCLIFFE, issued in one more surprising still, upon which the process of syphilisation is founded, namely, the strange and curative change of the disease when the inoculations are often repeated

in the same individual. Experimenting upon apes, it was found that the artificial ulcers regularly diminished in size and virulency, in proportion as the inoculations were multiplied, until at length the virus ceased to take effect. The system seemed to become protected, as in ordinary inoculation and vaccination, and a state or diathesis was produced, in which the body was no longer capable of being affected by syphilis; and the process by which this is accomplished is that to which the name *syphilisation* belongs. This result, also, is all the more surprising because reiterated inoculations were evidently essential to it, for only once inoculated and then left to themselves, the poor apes speedily perished with all the signs of the syphilitic cachexy. Having satisfied himself of the reality of these results, M. Auzias Turenne then proceeded to enquire whether man was capable of syphilisation. He had many ardent followers, who eagerly submitted to the experiment, and who shortly seemed to furnish evidence in the affirmative.[*]

156. This pretension excited great opposition, particularly in the Académie de Médecine. In other quarters, however, the impression was more favourable. At Turin, M. Casimiro Sperino, the chief surgeon in the Syphilicoma, or Syphilitic Hospital of that city, at once took up the new views, and put them to the test on a large scale. He was favourably inclined towards them, he tells us, for several reasons. He had observed that severe inguinal buboes are more apt to follow small and insignificant chancres, which heal in a few days, than those which are large and obstinate; that the constitutional symptoms held an almost inverse relation to the severity and continuance of the local disease; and that he had known many prostitutes, whose constitutions had never been sensibly affected, who had had chancres for years, either constantly open, or closed only to open again immediately. He had repeatedly satisfied himself that foul buboes were more prone to heal in those cases in which their syphilitic character had been tested, after Ricord's plan, by inoculations on the surrounding skin.

157. The subjects of M. Sperino's experiments were fifty-two hospital patients, all prostitutes, and all suffering from aggravated forms of primary or secondary syphilis. The virus was taken from the person syphilised, or from a comrade—from the first, if possible—and always from a growing ulcer. The inoculations were repeated once or twice a week in three or four distinct places, usually in the abdomen. The time required for the establishment of the artificial chancres was from two to three days. The effects of the second inoculations were less serious than the first, of the third, than the second, of the fourth than the third, and so on until the virus ceased to produce any effect whatever; contemporaneously with which epoch, all former ulcers had healed, and buboes, recent nodular enlargement of bones, and cutaneous stains or blotches had either disappeared, or were in rapid process of disappearance. The virus, also, which made no impression at this time, was found to retain all its virulence when tried upon an unprotected person.

158. Since this time M. Sperino has shortened the intervals between the several inoculations, and has increased the number of punctures in each operation to twelve, sixteen, or twenty, and with the effect (he tells us) of expediting the process, and of ensuring a slighter form of artificial chancre. He has also subjected his syphilised patients to a course of bathing in the sulphureous waters of Acqui, which waters are notorious for their power of bringing out secondary symptoms in the subjects of syphilis, and he has found them to resist this test as well as that of inoculation.

159. Such are the main particulars of these fifty-two cases, as gathered from M. Sperino's communication to the Academy of Medicine and Surgery at Turin. No other treatment was employed. They are said to have been without exception of an aggravated character, and without any spontaneous tendency to heal. For a month before the institution of the experiments they had been purposely left without any treatment, and during this period they had retrograded.

160. An account of Dr. Sperino's proceedings was given by Dr. Radclife (in Ranking's *Abstract of the Medical Sciences*, vol. xvi. p. 333.), and M. Turenne's experiments were noticed by Dr. de Meric (*Lancet*, July, 1853, p. 203.) before Dr. Sperino's work had appeared. The subject has been very recently brought before the profession in an able article on syphilisation in the "*British and Foreign Medico-Chirurgical Review*," (No. xxxvii. p. 410.), in which the subsequent experience of Dr. Sperino in Turin, of Professor Boeck in Christiana, of Dr. Danielsen in Bergen, and of Dr. Carlsson in Stockholm, during several years has been given. These enlightened men, professors and physicians to hospitals in cities where medical science is in its highest state of rational cultivation, instead of declaiming against the doctrine promulgated by M. A. Turenne, have been engaged in a series of careful experiments and observations to determine its truth or its fallacy. Experiment and careful observation can alone decide this question, which is one of the greatest importance in practical medicine.

161. Dr. Sperino's observations were confirmed by similar results obtained by Dr. Gamberini at Bologna, and by Dr. Gulligo at Florence. In 1853, Dr. Sperino published a detailed account of ninety-six cases of syphilisation. Of these ninety-six cases, fifty-three were of primary syphilis, and forty-three of the constitutional disease. Fifty of the cases of primary syphilis were cured, two failed, and one was not treated by syphilisation alone. "Of the forty-three cases of constitutional affection, twenty-six were treated by syphilisation alone, and seventeen by this method, in conjunction with mercury or iodine. Twenty-five of the twenty-six in the first category are said to have been cured. In only two cases of the primary disease did any constitutional symptoms appear, and these symptoms rapidly yielded under a continuance of the syphilisation. No relapse has yet taken place in any case. Many of these cases were of very severe character, and were such as were not likely to have healed spontaneously; while the numerous

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[*] In Dr. Winterbottom's work on the native Africans already referred to, it is stated, on the authority of Mr. Edwards the author of the "*History of the West Indies*," that the natives of the Gold Coast of Africa give their children the *yaws* by *inoculation*; and that they perform the operation by making an incision in the thigh, and inserting some of the matter from the sores of the yaws. By this means the infants or children have the disease slightly and recovered speedily; whereas, by becoming infected at a later time of life, it is much more severe, and "gets into the bone." (Vol. ii. p. 156.)

inoculations that were required, produced no serious effects, except in one or two instances a slight tendency to form phagedænic sores."

162. Dr. BOECK of Christiana, in 1853, published, in the seventh volume of the Norwegian Medical Journal, the results of a few experiments he had then made on syphilisation. Since then he has closely investigated the subject, and has extended the practice to infants at the breast. The same plan of treatment has also been pursued by Dr. DANIELSEN in the hospital at Bergen. When the writer of the review above referred to (§§ 160.) re-visited this hospital in July 1856, he was assured by this physician "that he fully coincided with the views of Dr. BOECK, and that the results obtained in Bergen by syphilisation were as successful as those recorded by the latter at Christiana." The reputation, talents, and high position of those physicians in Norway are unquestionable.

163. Dr. BOECK states that all the cases which he treated by syphilisation, laboured under constitutional syphilis, in its most varied stages and forms. Some of those cases had previously undergone every mode of treatment that science could devise, while others had had no treatment at all. He thought it of great importance to collect observations from both classes of cases. If syphilisation is not had recourse to till all other remedies have been tried, it is difficult to form a correct estimate of its powers; for under such circumstances, as Dr. BOECK justly remarks, we can hardly know what symptoms belong to syphilis, and what to the medicines administered; and particularly to mercury. He states, that cases which have undergone a mercurial treatment, persons of an inflammatory diathesis, habitual spirit drinkers, and weakly constitutions, should not be subjected to this treatment. In these cases the artificial chancres may take on a malignant action. "The bowels should be regulated, and the digestive organs brought into good order; but it is not necessary to enforce any strict rule of diet. In the hospitals of Bergen and Christiana, the ordinary full diet was always allowed." Dr. SPERINO and Dr. BOECK mention the readiness with which patients submitted to, and even sought for, the mode of cure which they had seen so successful with their fellow-sufferers.

164. ii. MODES OF INOCULATION. — M. A. TURENNE at first kept up a succession of single chancres; while SPERINO made three or four separate inoculations at once, and repeated these two or three times in the week. After having in this way reached twenty-four or thirty inoculations in all, he found that the chancres last produced were exceedingly small, and he then diminished the intervals, and made more inoculations at each sitting. He found that the first chancres were deeper, larger, and more inflamed than those which succeeded them: and that by diminishing the intervals and increasing the number of inoculations the earliest chancres visibly diminished, and were less painful and inflamed. After a large number of inoculations which did not appear successful, he returned to his former plan of inoculating for six to ten chancres at a sitting. "While these chancres are progressing, it is not advisable to inoculate afresh, nor should this be done until the former chancres are developed. Should the chancres be developed too freely and threaten active inflammation, or to extend as phagedænic sores, he checks their progress by inoculating afresh at shorter intervals."

165. The practice of Dr. BOECK differs little from that of SPERINO. He inoculates for two chancres only every six days, because he found from experience that it required about five days to produce induration in a chancre, although he does not consider this latter circumstance absolutely essential. He subsequently shortened his intervals to three days, and increased the inoculations to eight or ten. Less time is thus required to produce immunity; but Dr. BOECK is distrustful of pushing cases too rapidly through their course of syphilisation. With regard to the parts of the body selected by these physicians for inoculation, SPERINO preferred the lower regions of the abdomen, Dr. BOECK the arms and thighs.

166. The conclusions drawn by Dr. BOECK from the eighty-four cases of syphilisation, which he has treated up to March, 1856, are,—1st, That in all cases, without exception, immunity to the venereal virus is obtained sooner or later by inoculation of this poison; 2d, That the symptoms of syphilis present at the commencement of syphilisation disappear during the employment of this mode of treatment; 3d, That the general health does not suffer in the least from syphilisation — on the contrary, if the patient has been in weak health before inoculation, he most materially improves in strength and appearance during the process. These propositions are conceded as undoubted facts by Dr. BOECK's colleagues, by Dr. SPERINO, by M. A. TURENNE, by DANIELSEN, by Dr. CARLSSON, and by Dr. STENBERG of Stockholm.

167. *The time required to produce immunity* from syphilis by syphilisation depends upon the various strength of the virus, upon the rapidity or otherwise with which the inoculations succeed each other, upon the number of the chancres produced, and upon the idiosyncrasy of the patient. Dr. BOECK states that, "the attaining to immunity depends upon the length of the intervals between each inoculation — the more frequent the inoculation the more rapidly does it ensue. If there were sufficient virus to be obtained, we might, if we chose, inoculate every day; but if, as is generally the rule, we keep to obtaining the virus from the most recent inoculation, we cannot easily do this. From my own experience, I would say that the matter obtained in a pustule of only one day's growth is generally capable of being inoculated; but I have also seen that pustules of three days' growth produced no effect; while three days later, the matter taken from them was decidedly contagious." (p. 196.)

168. Granting that *immunity* is really produced from the disease, the question follows, Is it merely from the existing disease, or from any subsequent infection? and if from subsequent infection, is the immunity produced for a time only, becoming impaired gradually, and ultimately lost after an indefinite time; or is it continued through life, a diathesis being imparted by it, rendering the frame insusceptible of the syphilitic infection? That the immunity is at least, for a time, is shown by the fact of the last inoculation having failed to take effect, however virulent the matter employed. Dr. BOECK is of opinion that persons who have reached perfect immunity to inoculation in the course of syphilisation are insured against contracting syphilis for all the rest of their

lives; but the lapse of time since the first employment of this practice admits not of any conclusive evidence of the fact.

169. Of forty-two cases of constitutional syphilis, where no mercury had been previously used, *not one* had exhibited any relapse up to the commencement of 1856, and many of these had been for three years or more without requiring any treatment whatsoever. Of the twenty-one cases recorded in Dr. BOECK's first work, six had been treated without mercury, and in all these syphilisation dispersed the symptoms, which have never returned. The average duration of the treatment in these six cases was six months and two days, the average number of chancres were 322. In a second class of cases, in which the constitutional symptoms were chiefly confined to the skin and mucous membranes, but which had all taken more or less mercury, the average duration of treatment was six months and twenty-four days, the average number of chancres being 432; two thirds of the number being, however, very small and transient. In the third category of cases, in which the constitutional disease was very inveterate, all of which had been subjected to mercurial treatment, some repeatedly, the average duration of treatment was seven months and twenty-four days, the average of chancres 570.

170. The increase in both of the last categories of cases in the number of chancres, and in the length of time required to complete the cure, is ascribed by Dr. BOECK to the previous administration of mercury. It is, however, probable, as he observes, that another circumstance may have retarded the cure, viz., that the syphilitic virus may have undergone a material change during the many years it had been resident in the system. The more inveterate, and especially the tuberculo-serpiginous forms were found to be extremely rebellious to treatment, and some of them were not cured when immunity was reached. It was necessary then to have recourse to iodine, upon the exhibition of which all symptoms rapidly disappeared, though previous to syphilisation both mercury and iodine had proved inefficacious.

171. Dr. BOECK suspects that in those very obstinate cases an union of the syphilitic with mercurial poison has taken place. In most instances this union seems to be dissolved by syphilisation, and then iodine, which had before been ineffectual against the united poisons, acts readily on the mercury, and eradicates it from the system. During the two years elapsed from the publication of his first work, he had treated sixty-three cases by syphilisation, and of these thirty-six had never taken mercury. In the twenty-seven cases, for which mercury had been given, he invariably found the cure more difficult, and in some cases impossible without the aid of iodine. Where mercury has not been employed, he is decidedly in favour of syphilisation, for, as far as can be ascertained from the forty-two cases of this character thus treated, no relapse had occurred up to the present period. A great objection to syphilisation is the length of time required for its complete performance. In the Christiana hospital, the average duration of the mercurial cure is three months and a half, while syphilisation averages a full half year. If, however, the latter be not liable to relapse — at least in non-mercurialised cases — it is preferable even if it required a much longer period. It is doubtful whether it be possible to syphilise, so as to cure permanently, by matter taken from one source alone; for Dr. BOECK met with cases where complete immunity existed to the matter taken from one source; but upon obtaining fresh virus from other persons, the inoculations succeeded perfectly again. However, he has been able, in some instances, to effect a complete and permanent cure with matter from one source alone.

172. I have given this account of syphilisation, as it is hardly known in this country. It is manifest that it could not be rationally submitted to, but as a cure of the distemper, and not by a healthy person to prevent the infection of it. If, however, it be found to be by further experience, not only a permanent cure, but also a permanent preventive, it will establish for itself a reputation not possessed by any other means; for none besides, however judiciously administered, has been found constantly and permanently curative,—has proved a remedy under all circumstances, and for the future duration of life in all cases.

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iii. SYPHILISATION.—*Diday*, in Gazette Médicale de

Paris, July 10th, 1852 (*Syphilisation*). — *V. De Meric*, in Lancet, July, 1853, p. 233.—*C. B. Radcliffe*, in Half-yearly Abstract of the Medical Sciences, &c., vol. xvi. p. 333.—*W. Boeck*, Syphilizationen, 8vo. Christiana, 1854.—Also Die Syphilization bei Kindern, 8vo. Christiana, 1856.—*Anon.* in British and Foreign Medico-Chirurgical Review, &c., No. xxxviii. April, 1857, p. 410. The writer of this review has observed this practice in the hospitals in Christiana and Bergen.

VERTIGO. Syn. — *Vertigo* (from *verto*, I turn round); περιστροφὴ, σκότωμα. *Vertige*, Fr.; *der Schwindel*, Germ. *Giddiness, dizziness, swimming in the head.*

Classif. — IV. Class. III. Order (*Author*).

1. Defin. — *A transitory erroneous perception, or a sense of general whirling or turning round, with difficulty of standing, or a feeling of impending sinking or falling.*

2. *Vertigo* has been noticed by Hippocrates, Galen, Aretæus, and other ancient writers; and, by these, as well as by modern writers, it has been viewed chiefly as a symptom of many diseases, and in some, but in much rarer cases, as the chief or only apparent disorder. That it is as much a primary affection, on some occasions, as headach, or several other disorders, may be admitted, although it may be shown, if the pathogeny of the affection be duly considered, that it is commonly owing to previous disorder of the organic nervous influence endowing the brain, or to the state of the capillary circulation in this organ, or not improbably to both in various degrees. In the great majority of cases, however, it is merely a symptom, either of a very early, or of a more or less advanced stage of some malady, very often of some disease which has not fully declared itself, or which still remains latent or imperfectly developed, or of extreme debility, or of protracted indigestion, &c.

3. I. Description. — Vertigo occurs as an illusion, or a transitory erroneous perception of objects, although quiescent, in a state of more or less rapid motion, usually in that of gyration or whirling round; but also not infrequently with either a descending or ascending movement, or with a sense of sinking. In the more extreme cases, or when caused by ebriety, these sensations are often present in a greater or less degree, although the eyes at the time are quite shut. In some instances the objects which thus appear in motion are also changed in colour — are either variegated or obscured. Vertigo may be experienced only when assuming the erect posture, as in cases of fever, extreme debility, &c.; but it may also be felt whilst recumbent in bed, objects presenting not only a rotatory, but also an ascending motion, with a feeling of sinking, and sometimes also with noises in the ears. In this latter form it should be viewed as a most serious symptom, especially when occurring in malignant or pestilential maladies, or when these are prevalent, or in the course of organic disease of the brain. In many instances, vertigo precedes, or is followed by, severe paroxysms of retchings or of vomitings. This sequence is commonly observed in pestilential cholera, in sea-sickness, in fits of drunkenness, after ingestion of the sedative or depressing and irritating poisons, and especially after the improper or inordinate use of tobacco. In all cases of vertigo, walking or even standing is difficult or impossible; and from a dread of falling, objects are laid hold of for support. Vertigo may be only temporary and quickly evanescent, or it may continue for a considerable time. It is more rarely continued or prolonged. It is often evanescent, but marked, when it occurs as a prelude of syncope, or of fully developed disease of the brain, as epilepsy, paralysis, or apoplexy. It often precedes amentia and other states of insanity. Swift was very subject to vertigo at different periods of his life, and more especially before the loss of his powerful mental faculties. It is more prolonged or continued when it is a symptom of either active or passive congestion of the cerebral vessels, or of anæmia of the brain, or of the vascular system generally. When vertigo occurs as a severe or acute paroxysm, it may gradually pass into the epileptic state; the extreme giddiness, after several occurrences of the seizure, being attended by a temporary loss of consciousness, and ultimately by convulsions and all the phenomena of a complete epileptic attack.

4. The more continued or prolonged states of vertigo are generally referrible to the following pathological conditions: — 1st, To determination of blood to the brain; 2d, to congestion of blood in the cerebral vessels, owing to impeded return of blood or retarded circulation through the heart; 3d, to lesions of the cerebral arteries, and softening of the structure of the brain; 4th, to general or local, momentary or prolonged, anæmia, or insufficient supply or circulation of blood in the brain. In these states, however, one or other of the primary changes already assigned as characterising the more evanescent states of the affection (§§ 3.) are also present. In either of these forms, or owing to either of their pathological states, vertigo may manifest certain grades, either of which only may be complained of, or all of which may supervene in succession, either very slowly and imperceptibly, or more or less rapidly. These states or grades are usually described as — 1st, confusion, unsteadiness, or indistinctness of perception; — 2d, dizziness or fear of falling; — 3d, giddiness, with incapacity of progression; — and 4th, swimming in the head, or complete vertigo, with an incapability of standing.

5. i. *The occasional exciting causes* of vertigo are very different, or even opposite in different cases. Whatever determines the blood inordinately to the brain, as, long and intense thought and reflection,—or prevents or impedes the return of blood from this quarter, as, cinctures, of the neck, &c.; and whatever promotes a rapid return of blood from the brain, as, suddenly assuming the erect from the recumbent posture, long abstinence, inanition, and, in short, whatever occasions too great fulness, on the one hand, or too great a deficiency of blood in the brain on the other, will, in weak, susceptible, or predisposed persons, give rise to this state of morbid perception.

6. Vertigo is most frequent in persons of advanced age, in hysterical females, in persons who are bald, especially on exposure to cold, or in cold seasons and in variable weather; in those liable to hæmorrhoids, epistaxis, or other hæmorrhages, especially when these are suppressed, and in crowded and close apartments; in females during prolonged lactation; in persons addicted to excessive sexual intercourse, or to the vice of

tient should be ascertained, and a more or less complete change of these habits be insisted upon, as far as his age and other circumstances may render the change advisable.

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VOICE AND SPEECH — Disorders of.—

1. Voice and speech are functions by means of which the human species claims and maintains an ascendency over all animated nature. The more perfect animals, including the winged creation, possess the power of emitting vocal sounds, which admit of such changes in power, modulation, and character, as convey intimations to individuals of their own genus or species of danger, of pleasure, of sources of nourishment, of desire, and even of affection. The practised ear can recognise, in nearly all animals which emit sounds, variations in cadence, character, and power, which are known by the same species as announcements of the presence of objects of prey and subsistence, of sources of danger, of the loss of offspring or objects of affection, and of danger, suffering, or distress. And it is by no means improbable, that the sounds characteristic of individual species, even of the lowest capable of emitting them, are so modulated as to convey to one another the various instincts and suggestions, which seasons, localities, and external circumstances and influences, may excite; the sounds thus modulated becoming known, as regards each species, as a distinct, but limited language, although unknown, unless in its more manifest and prominent characters, to man.

2. The sounds produced by the organs, so wonderfully and beautifully provided for them, in the human species, are the chief means of developing the mental faculties, of exercising dominion over the rest of the animal creation, and of acquiring and of exerting power over those requiring guidance or governance. The sounds produced by the human organs of vocalisation and articulation are the manifestations furnished to the species of the finest sentiments, of the deepest as well as the highest states of feeling, of the most profound and abstract results of thought, and the wisest and best revelations of mental reflection and of human reason. But considered philosophically, they are studies rather for the physiologist than for the pathologist. To the latter, however, the more strictly philosophical consideration of human sounds, as manifested in the modulated voice and in speech, becomes a necessary introduction to an intimate knowledge of the several modes in which both voice and speech are disordered, or more or less impeded, or even lost. For these preliminary sources of knowledge the reader is referred to the recent writings of Müller, Carpenter, Todd and Bowman, Bishop and Willis, which are in the hands of most medical men.

3. Vocal sounds and articulate speech or language are two distinct functions; and although the latter proceeds from the former, an additional apparatus is required for its production. The instrument of vocal sound, the larynx, is distinct and appropriate to this purpose, and is calculated by its mechanism to produce the several grades and modulations of voice; but, although thus independent, the vocal sounds cannot be modified into articulate speech, or even into a near approach to articulation, without the aid of the *oral cavity*, more especially of the *tongue*. Hence there may be vocal sound without speech; but this latter cannot be produced without the former; and hence both may be separately or even conjointly disordered, or even lost. But, although speech may be altogether lost, a vocal sound can hardly be quite lost whilst respiration is performed, unless in complete syncope, catalepsy, apoplexy, in the coma of fever, and in other occasions of loss of sensibility and consciousness; for even in these states, unless in profound syncope and catalepsy, a simple or low respiratory sound may still be emitted.

4. I. Voice is produced, according to Mr. Bishop, by the conformation of the vocal apparatus, which combines the properties of a stretched chord, a membranous pipe with a column of air vibrating in it, and a reed, and is the perfect type, of which these instruments are only imperfect adaptations. Dr. Carpenter states, "that the sound is the result of the vibrations of the vocal ligaments, which take place according to the same laws with those of metallic or other elastic tongues; and that the pitch of the notes is chiefly governed by the tension of these laminæ." However, the

various tones, modulations, &c. of the voice may be explained, or referred severally to the especial or combined movements and actions of the different parts constituting the vocal apparatus by physiological writers, it must be manifest that a healthy condition of the vocal chords and ligaments, of the cartilages, of the muscles which move them, and of all the parts both above and below the larynx, as well as of the larynx itself, and the mucous membrane covering it and its vicinity, and even of the velum palati also, is necessary to the production of the human voice in its natural and perfect state; and consequently that this function, capable of the utmost perfection, of the greatest range in power and modulation, and of astonishing improvement as regards these, by careful and scientific cultivation, depends upon a perfect condition of these several parts, disorder or structural lesion of any one of them affecting the voice in a more or less remarkable manner.

I. APHONIA.—LOSS OF VOICE.—SYN. — 'Αφωνία (from α priv. and Φωνὴ, voice). — *Aphonia*, Vogel, Sagar, Cullen. — *Dysphonia*, Good. — *Raucedo paralytica*, Darwin. — *Perte de la Voix*, Fr.—*Die Stimmlosigkeit*, *Aphonie*, Germ.
CLASSIF. IV. CLASS. II. ORDER. (*See Preface.*)

5. DEFINIT.—*More or less impairment or complete loss of the power of emitting vocal sound, owing either to functional disorder or to structural lesion.*

6. The voice may be impaired in every degree from the slightest catarrhal form to the most complete loss from organic change. The impairment or loss may be either temporary or permanent. The slightest as well as the less permanent aphonia often proceeds from functional disorder, especially from extreme nervousness, fright, fear, and hysteria; but it also is frequently caused by catarrhal congestion of the mucous membrane of the larynx and of the subjacent cellular tissue, and by temporary impediment to the movements of the vocal chords from this cause, or from inflammation and its results implicating for a time any of the parts of the vocal apparatus. In the more strictly nervous states of aphonia there is no manifest lesion of structure, the nerves supplying the laryngeal muscles and chords having become for a time incapable of conveying the dictates of volition to these parts, unless volition be most energetically exerted.

7. *A.* FUNCTIONAL APHONIA occurs chiefly in delicate, nervous, or hysterical females, and much more rarely in similarly constituted males. In the former sex it is most frequent about and subsequently to the period of puberty, and during the catamenial epoch of life; in the latter chiefly before the period of puberty, and only in very rare cases, and when occasioned by fear or fright, and it is then of short duration only.

8. *Hysterical Aphonia* may be viewed as one of the forms of functional paralysis, which not infrequently complicates disorder of the female organs, such disorder being generally either not otherwise manifested, or latent, or masked by some other affection. In most cases it is easy to distinguish the hysterical from all other forms of aphonia; other allied symptoms, the previous history of the case, the state of the uterine functions, the moral affections, impressions, and sentiments, which may have preceded the loss, &c., generally indicating its nature. It should not be overlooked that, in hysterical females, more especially in those most subject to uterine or sexual irritation, aphonia is sometimes *feigned*. In rare instances, also, it may be difficult to determine whether or no it is hysterical or owing to structural disease in or near to the base of the brain; and this difficulty is increased, 1st, by the absence of other hysterical symptoms, and, 2dly, by the presence of other states of cerebral paralysis, the catamenial functions or organs having been previously disordered. I was recently called in consultation to a delicate nervous female, aged 18, who had menstruated irregularly and scantily, and was seized with incomplete hemiplegia and complete loss of voice; the muscles of the face not being affected. In this case it was difficult at first to determine whether the aphonia was hysterical or owing to some lesion within the cranium, causing also the hemiplegic affection. Their history and progress, however, generally elucidate the nature of these cases.

9. *B.* STRUCTURAL APHONIA is caused, *firstly*, by changes implicating one or more of the parts composing, or in the immediate vicinity of, the vocal apparatus; and, *secondly*, by lesions at the origin or in the course of the nerves distributed to the laryngeal muscles and vocal chords. The slighter or more incomplete forms of aphonia are those of a catarrhal nature, arising from more or less congestion and tumefaction of the mucous and submucous tissues of the larynx and adjoining parts. Severer cases of aphonia are often occasioned by serous infiltration into the submucous tissue, with or without inflammation of the mucous membrane of the larynx and of its vicinity, in the direction either of the fauces or of the trachea, or of both. This serous infiltration may be slight, and continue only during the catarrhal attack, or it may be so very considerable as to nearly suppress the voice altogether and cause suffocation, as observed in *œdema* of the glottis and epiglottis. Aphonia from this and other affections of the vocal apparatus is fully considered in the articles LARYNX and TRACHEA, where the lesions which affect the voice are described, and the treatment appropriate to each pointed out. The voice may also be affected in different degrees by inflammatory affections of the fauces, pharynx, and tonsils, by tumours in these situations, or by morbid growths pressing upon or implicating the larynx or trachea, by aneurisms, and most frequently by chronic laryngitis and its consequences, especially thickening, ulceration, &c., arising either primarily or consecutively of acute laryngitis, or of tubercular disease of the lungs, or of syphilitic infection. All these are fully discussed in the articles now referred to; but in all the voice is affected rather than the power of articulation, which is perfect as far as the production of vocal sound admits; for the affections of the larynx in such cases are rarely associated with any interruption to the movements of the tongue and of the parietes of the oral cavity, by means of which articulation or speech is performed.

10. II. DEFECTUS LOQUELÆ, SYN.; — *Alalia*, Frank.; — *Loquela Abolita*, Auct. Var.; — *Mutitas*, Sauvages, Macbride, &c.; — *Sprachlosigkeit*, *Stummheit*, Germ.; — *Loss of Speech.*

11. *Voice*, as stated above, is produced by the *larynx*, its modulations into musical sounds being

effected by means of this organ aided by the epiglottis and adjoining parts. *Speech* is the modification of the voice, or sounds emitted by the larynx, by the organs or parts intervening between it and the os externum. It is obvious that, to produce articulate sounds, forming language, the movements of the tongue, fauces, and connected parts must be complete; and that these should be in a healthy condition to render articulation perfect. The tones of the voice, and articulate speech, cannot be produced in childhood, when the sense of hearing is completely lost in early infancy, or in the fœtal state; and as long as the sense of *hearing* continues lost, *dumbness* is the result; for the sense required to modify and adjust vocal sounds does not exist.[*] *Voice*, especially in its healthy and cultivated states, and in its modulations into music, is capable of expressing the several emotions of mind, in a more remarkable degree and manner than articulate speech; but *speech* or language has a much greater, more varied, and more extensive power of addressing, informing, and enriching the intellect, of furnishing definite ideas of objects, properties, actions, &c., and of conveying the results of reflection and of rational deductions. The vocal organ, aided by the movements of the tongue and parts composing the oral cavity, is adapted for, and in health is capable of, forming a number of simple sounds, which are readily combined into groups forming words. Dr. CARPENTER justly remarks, that the number of combinations which can be thus produced is so inexhaustible that every language has its own peculiar series; no difficulty being found in forming new ones to express new ideas. There is much diversity in different languages, even with regard to the use of the simplest of these combinations; some of them are more easy of formation than others, and these accordingly enter into the composition of all languages; whilst, of the more difficult ones, some are employed in one language, some in another; no one language possessing them all, or using them to any co-ordinate extent.

12. The mechanism producing vocal sounds being complicated, and actuated in its individual parts and in its combined movements by volition, and by the states of vital force, as influenced by health, constitution, and disease, and adjusted by the sense of hearing, it necessarily follows that the faculty of speech, in whatever language, will be modified, altered, interrupted, impeded, and even altogether lost, in numerous modes, so as not only to furnish most important indications of disease of the slightest as well as of the most dangerous nature. The articulate sounds which have become familiar to the ear, are often remembered as long as the appearance of the person by whom they were furnished; and the person, even after many years, is often recognised by his voice and speech before he is seen. Debility weakens the articulating power, or the strength of articulate sound; but disease may alter it more remarkably, different maladies affecting it in various ways. When the voice is altered, or lost by disease, the speech is then necessarily similarly circumstanced, as already stated (§§ 5. *et seq.*) But speech is more especially affected as a precursor, or as a symptom, of apoplexy and paralysis; and, when so affected, it indicates the most serious results at a period, which, although indefinite, may generally be viewed as comparatively short. In cases where speech is altogether lost, especially at an advanced age, or is so nearly lost as hardly to be understood, or when the sounds are mostly inarticulate, if no apoplectic or paralytic seizure have preceded or accompanied this loss, then either of these seizures may be expected before a long time elapse, unless the time be deferred by treatment, and diet, and regimen; and more frequently, notwithstanding these means of prevention (see arts. APOPLEXY and PARALYSIS).

13. *Loss of speech*, whether complete or incomplete, is generally to be imputed to structural disease, wounds, or fractures, implicating either parts within the cranium, or the nerves in their course to the organs of articulation. Cases of loss of speech, consequent upon apoplexy, or associated with other paralytic states, are very frequent, and are by no means rare as a precursor of a dangerous apoplectic or paralytic attack. When this present, as the only apparent ailment, the result is not the less to be dreaded. In several cases, for which I have been consulted in the course of my practice, speech was so completely lost, that no articulate sound was produced, the simple vowel-sound *a* and *o* being only omitted, and yet none of the organic, or of the cerebro-spinal functions, and none of the senses, evinced any disorder. In all these, an apoplectic, hemiplegic, or more general paralytic seizure supervened generally in a few weeks or months, owing to the development of latent pre-existing organic lesion. Whenever, therefore, the faculty of speech becomes impaired, or is lost by persons who had previously possessed this faculty in a healthy state, more especially if this change occur in mature, middle, or advanced age, it should be viewed as a form of local or partial paralysis, which is generally followed, at no very remote period, by a very dangerous form of apoplectic, or of more general paralytic seizure.

14. III. IMPEDIMENTS OF SPEECH — HESITATIONS OF SPEECH — STAMMERING — STUTTERING. — This affection is generally functional, or of a nervous nature; and may present several forms. These are usually observed in childhood and in early life; whilst incomplete or complete *loss of speech*, briefly considered above (§§ 13. *et seq.*), is the consequence of structural lesion or of injury, and is a form of paralysis of a most dangerous nature. *Hesitations* in articulating sounds, or a momentary impediment in uttering certain words or letters, or a stammering, or repetition of certain consonants, are generally observed from

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[*] The nicest modifications and adjustments of the actions of the muscles of the larynx, and of the several parts of the fauces and oral cavity, are requisite to the production of determinate tones, accents, and speech; and these actions are ordinarily adjusted and modified by the sense of hearing. Hence a fine or educated ear in music is of great advantage in singing and in the pronunciation of languages. This adjustment, being learned in the first instance under the guidance of the sounds actually produced and heard, is subsequently effected voluntarily, in accordance with the mental conception — or inward sensation—of the tone or sound uttered, which conception cannot be formed unless the sense of hearing has previously brought similar tones to the mind. Hence it is that persons who are born, or become, quite *deaf* before articulate speech is formed or attempted, are also *dumb*. They have no malformation, no paralysis of any part of the organs of voice and speech; but they cannot utter distinct musical tones or articulate speech, because they have not the guiding conception or sensation of the nature and character of these sounds, furnished by the sense of hearing.

infancy or childhood, but they may increase or diminish, or even disappear as age advances. They may continue during a long life, or they may occur only occasionally. In this latter case, they are induced or aggravated by fear, anxiety, and various mental emotions. They cannot be mistaken for impairment or loss of the previously healthy power of articulation, which, as stated above (§ 13.), proceeds from slowly-formed organic lesions implicating the origins or course of the glosso-pharyngeal nerves; and which occurs under different circumstances, and is attended and followed by very different phenomena and consequences.

15. The muscles employed in the production of definite vocal sounds and of articulate speech, being actuated by volition conveyed from the brain to these muscles by means of the nerves proceeding from the former to the latter, it necessarily follows that both voice and speech depend on the capability of the brain to generate or exert volition, and of the nerves to convey this act to the muscles. Thus speech, as well as voice, requires for its perfection a due exertion, and a healthy transmission of volition, by means of the nerves, to the apparatus destined to its production; and, if volition be feebly exerted, or imperfectly transmitted to the muscles concerned in articulation, various imperfections of these functions will result. But the complete performance of both voice and speech depends also upon the healthy functions of the lungs and respiratory passages, these functions being modulations of expiration by means of the larynx, tongue, fauces, oral cavity, and lips.

16. Thus it is apparent, as remarked by Mr. Bishop, that "the mechanism provided for the production of speech comprehends a large assemblage of organs. The most simple vocal sounds require the combined action of the lungs, windpipe, larynx, and respiratory muscles; and for articulate language, an additional set of organs must be called into play, namely, the pharynx, hard and soft palates, uvula, tongue, teeth, lips, and nostrils."

17. It is justly observed by Dr. Carpenter that, "great as is the number of muscles employed in the production of definite vocal sounds, the number is much greater for those of articulate language; and the varieties of combination which we are continually forming unconsciously to ourselves, would not be suspected, without a minute analysis of the separate actions. Thus, when we utter the explosive sounds (explosive consonants), we check the passage of air through the posterior nares, in the very act of articulating the letter; and yet this important movement commonly passes unobserved. We must regard the power of forming the several articulate sounds and their simple combination, as so far resulting from intuition, that it can in general be more readily acquired by early practice than other actions of the same complexity; but we find that, among different races of men, there exist tendencies to the production of different sounds, which, though doubtless influenced in great degree by early habit (since we find that children, when first learning to speak, form their habits of vocalisation in great degree in accordance with the examples amidst which they are placed), are certainly also dependent in part upon congenital constitution, as we often see in the case of children among ourselves, who grow up with certain peculiarities of pronunciation, not thus derived from imitation, of which they do not seem able to divest themselves."

18. I must refer the reader to Mr. Bishop for a notice of mechanical contrivances for the production of vocal sounds; but these can never sufficiently illustrate the intonations of voice or the production of articulate speech, or even satisfactorily show what it is that constitutes the essential character or distinction between the vowels, and on what part of the mechanism of the voice the vowel-sounds depend. These sounds, as well as those of the consonants, are formed by so slight changes in the relative position of the several parts of the complex organs of voice and speech, varying in accent and intonation so remarkably with the language, &c., as hardly to admit of any estimate. Mr. Bishop observes that, "in the application of the theory of vowel-sounds to the mechanism of the human voice and speech, there are two hypotheses which would equally satisfy the conditions for their production artificially. The first is, that the glottis produces the primary, and the *air* in the pharynx, mouth, and nostrils, the secondary or vowel-quality pulsations. The second is, that the glottis produces the primary, and the *membranes* of the pharynx, mouth, and nostrils, produce the secondary pulsations of the air." Dr. Thomas Young observes, in respect of the first of these, that the "reflection of the sound from the various parts of the cavity of the mouth and nostrils, *mixing* at various intervals with the portions of vibrations directly proceeding from the larynx, must, according to *the temporary form of the parts*, variously affect the laws of the motion of the air in such vibration."

19. As to the second view, Mr. Bishop remarks that, "we know by experience that the breath passing through the glottis is thrown into a certain state of vibration, and reaches the cavity of the mouth, which is already so disposed as to present a proper extent of its own membranes to the action of the breath. By these means the membranes are also made to vibrate, and these latter vibrations, coexisting with the original vibrations of the glottis, may generate the vocal sounds." Now the chief objections which may be offered to this view are, that the surfaces of parts, over which the vibrations of air from the glottis pass, are not membranous or are not membranes capable of vibration, but are surfaces constantly changing their configurations by means of the muscles by which they and the subjacent parts are actuated, the vibrations of air thrown out by the glottis being modified or changed by the alteration in the configuration of these surfaces — of the surfaces of those parts between the glottis and the external features — so as to produce the different vowel-sounds, and to pass from one simple vowel-sound to another. Without attempting to proceed further in the consideration of the other simple sounds, or of the physiology of voice and speech, my limits oblige me briefly to notice the more practical part of this subject.

20. Very great ignorance, some mischief, and no little discredit to medical science, have been displayed by the energetic proceedings of some surgeons who have either written upon *stammering* and *stuttering*, or who have officiously meddled with, and injuriously operated upon, certain parts which are in no way implicated in the

order under consideration. It has been supposed by these meddlers, with surpassing profundity, that these momentary or temporary affections arise from some lesion of the muscles of the tongue, or of the frænum linguæ, or of the velum palati, or of the uvula, or even of the tonsils, each acting on his own peculiar inspiration—with a success properly exposed by Mr. Bishop, and sufficiently manifested to my own observation. It must be very demonstrative of the progress of surgical science to see one surgeon "dividing the muscles of the tongue at its root, cutting at the same time through the linguales, the genio-hyo-glossi, and stylo-glossi muscles, with thin blood-vessels and nerves; or cutting a transverse wedge-shaped slice out of the dorsum of the tongue!" Or another surgeon extirpating the tonsils, which may affect the pitch and the quality of the voice, but which can have nothing to do with stammering! Or a third surgeon, cutting off the uvula, which is unconcerned in articulation! Now these pleasant operations have all been done, and may be done again and again under the seductive and perfectly safe (?) influence of chloroform, but what are the results? Let the victims articulate the answer, if they can intelligibly — for I have seen some of them who found this very difficult. For, as I have already noticed in another place, both the uvula and the tonsils perform functions necessary to the perfection of both voice and speech; and if these be removed, the pharynx and glottis are insufficiently lubricated, and are liable to experience, in consequence, more or less irritation, often passing into chronic inflammatory action, as have been demonstrated by cases which have come under my observation, and in which these parts had been extirpated. In other cases, where these effects have not appeared, or where the speech has been without huskiness, or any lesion of distinct articulation, the voice has been so much injured as to prevent attempts to sing.

21. There are several *conditions* which combine to produce stammering, each being more or less concerned in the morbid effect. The *first* is imperfect vocalisation, or an insufficient expiration owing generally to an imperfect respiration or to the lungs having been nearly emptied of their due quantity of air at the moment of articulation; — the *second* is an insufficient force of volition, by which the act of articulation is attempted; the *third* is, generally owing to the foregoing, a want of synchronous and appropriate action of one or more of the parts concerned in the production of voice and speech; and *fourth*, an irregular or spasmodic action of some of the muscles engaged in articulation. This last state is generally also a consequence of attempts at articulation being made either without sufficient force of volition, or without due vocalisation, or during an insufficient expiration from defect of air. It follows from the above, that the chief source of stammering is to be referred to the nervous centres — more especially to the seats of volition and emotion, and to the functional condition of the medulla oblongata.

22. Dr. Carpenter has justly remarked the analogy between stammering and chorea, the former being sometimes one of the modes in which the disordered condition of the nervous system in chorea manifests itself. "The slightest disturbance of the feelings is sufficient in most stammerers to induce a complete perturbation of the vocal powers; the very fear that stammering will occur, particularly under circumstances which render it peculiarly annoying, is often sufficient to bring it on in a predisposed subject; and the tendency to consensual imitation sometimes occasions stammering in individuals (especially children) who never show the slightest tendency to it except when they witness the difficulty in others."

23. That one or more of the *four conditions* which I have stated to be chiefly concerned in the production of stammering actually exists, will appear from what is observed as to the manner in which timidity, fear, and anxiety affect these conditions, and, by thus affecting them, produce in many persons either stammering or stuttering, although they are not subject to these disorders of articulation in other circumstances. On this topic Mr. Bishop very correctly remarks:—"The emotions which arise in a person when he is about to address an audience, are often so overpowering that the voice loses its natural volume, becomes tremulous, and sometimes inaudible, the respiratory functions are irregular, the flow of ideas is impeded, and the articulating organs perform their office so imperfectly, that he who is generally ready and fluent in conversation, hesitates, stammers, and cannot utter a single connected sentence. Now if persons, who at other times have a perfect voluntary control over the organs of voice and speech, partially lose it under the circumstances just mentioned, *à fortiori* those who have at all times an imperfect control over their articulation will, in similar states of feeling, find their powers paralysed, and their speech more than usually defective."

24. But it is chiefly in childhood and boyhood, when the sensibility and the emotional susceptibility are greatest,—whilst the due co-ordination of those movements of the parts which contribute to correct articulation is either being formed, or is in the course of developement, or only recently perfected,—that stammering either commences or is chiefly manifested. At these ages, and more especially in those children in whom the faculty of speech is slowly developed, or appears only at a later period than usual, the emotions are most likely to disturb the force of volition, and, with this disturbance, the normal exercise of the intellectual, the respiratory, the vocal, and the articulating functions.

25. Whatever may be the cause or nature of the changes in the brain corresponding to the several emotions, they are propagated to the medulla oblongata, and influence the action of the respiratory and the motor nerves of the face, throat, and tongue, as well as other nerves, and through them the muscles they supply. The emotions may thus occasion irregular actions of the parts concerned in articulation: 1st, by causing a momentary spasm or closure of the glottis, and thereby arresting all vocal sound; 2d, by causing irregular action, or by closing the isthmus of the fauces and obstructing the pronunciation of letters and syllables which begin with *guttural letters*; 3d, by the irregular or spasmodic motion of the tongue, the dorsum of this organ being carried backwards, or brought into contact with the palate, thereby affecting the *lingua-dentals, lingua-palatals*, and *lingua-palato-*

nasals, and syllables or words commencing with these letters; and 4th, by closing the lips and posterior nares, by affecting the pronunciation of the *labials*, and even also of all the other letters. An acute and experienced observer may readily detect the particular cause of obstruction,—whether the glottis, fauces, the dorsum or tip of the tongue, or lips.

26. IV. THE TREATMENT of stammering must be based upon the result of observation as to the seat of difficulty, or obstruction in the organs of articulation. Dr. ARNOTT proposes that all the words should be connected by a vocal intonation, in such a manner that there shall never be an entire stoppage of the breath. But the difficulty is often at the commencement of a word or sentence, especially when the glottis is spasmodically or irregularly affected; and, as MÜLLER contends, this plan cannot do all that is required, as the impediment often occurs in the middle of words, although it may afford some benefit. The most important remedial means is that much insisted upon by Dr. CARPENTER, and this is to study carefully the mechanism of the articulation of the difficult letters, and to practise their pronunciation, repeatedly, slowly, and analytically. "The patient would at first do well to practise sentences from which the explosive consonants are omitted; his chief difficulty, arising from the spasmodic suspension of the expiratory movement, being thus avoided. Having mastered these, he may pass on to others, in which the difficult letters are sparingly introduced; and may finally accustom himself to the use of ordinary language. One of the chief points to be aimed at is to make the patient feel that he *has* command over his muscles of articulation; and this is best done by gradually leading him from what he finds he *can* do, to that which he fears he *cannot*" (*op. cit.* p. 771.).

27. The circumstance of stammerers being often able to *sing* their words better than to speak them, has been explained by the supposition that, in singing, the glottis is kept open, so that there is less liability to its spasmodic action; but, in singing, the velum palati, and the other parts concerned in articulation, are also much less liable to irregular or spasmodic action, they being brought less into action than in articulation. The difference may, however, as Dr. CARPENTER supposes, be due to the direction of the attention rather to the muscles of the larynx than to those of the mouth. One of the most obvious and important objects in the treatment of stammering is the prevention of any emotional disturbance during the act of speech; "and this requires the exercise of the voluntary powers over the direction of the thoughts, in the following modes: — 1st, To *reduce* mental emotion, by a daily, hourly habit of abstracting the mind from the subject of stammering, both while speaking, and at other times; — 2d, To *avoid exciting* mental emotion by attempting unnecessarily to read or speak, when the individual is conscious that he shall not be able to perform these actions without great distress; — 3d, To *elude* mental emotion, by taking advantage of any little artifice to escape from stammering, so long as the artifice continues to be a successful one." Having mastered the articulation of the difficult letters, and of the words containing them, and having thus avoided or overcome mental emotion, the patient should practise reading and speaking aloud, slowly, and with due enunciation and intonation, and with a full and free respiration, never allowing the lungs to become too far exhausted of air. Due attention should also be paid to the digestive and excreting functions, and to the improvement of the organic nervous force and of the mental powers, by air, exercise, medical treatment, and diet. Frequent declamation, and reading or reciting aloud such passages as interest the mental emotions, should be practised as soon as the patient has acquired a complete command over his articulation and over the difficulties which mental emotions have occasioned him.

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various mechanical or structural causes of intestinal obstruction, as shown in various places (*see Arts.* Colic and Ileus, Concretions, Biliary and Intestinal, &c.); more particularly when the vomitings are attended by fœtid eructations, and when the vomited matters present a fœtid or fæcal odour, or a more unmistakable fæcal character. In all cases of obstruction, and irritation, of any of the ducts and canals within the abdomen, especially when the obstruction is caused mechanically or by a solid body, the sympathetic occurrence of vomiting is generally very urgent and distressing, although often presenting intervals of comparative ease. In all cases of vomiting and retching, the history of the case should be ascertained as fully as possible.

20. Besides these more strictly local diseases, which are attended by vomitings and retchings, there are several constitutional maladies, especially those adverted to above (§§ 18, 19.), in which these symptoms are of a most prominent character, and proceed from contamination of the blood, acting both on the frame generally and upon the stomach and its allied viscera in particular. No doubt that in all these maladies, whether the choleric and hæmagastric pestilences, or the contamination occasioning malignant puerperal fevers, or that arising from poisoned wounds, inoculation, &c., the morbid impression is primarily and energetically made upon the organic nervous system, the retching and vomiting often following closely upon it; but nevertheless, this impression being made, the alteration produced in the blood aids it, and promotes both by increasing the depression of the organic nervous force, and by irritating the stomach and adjoining parts, thereby rendering the vomitings of a more serious, dangerous, or obstinate character, as evinced in these maladies.

21. IV. Vomiting and Retching from Sea-Sickness are common to all persons soon after they feel the motions of vessels on the sea, if they have not acquired an immunity from this suffering by habit.

22. i. Description.—In some, vomiting is preceded by a prolonged nausea, with extreme prostration, faintness, vertigo, and apathy. In others, vomiting takes place more or less quickly, after nausea is first felt; and in many the nausea and distressing retchings, with headache, vertigo, and prostration, continue or return at shorter or longer intervals after the stomach has been completely evacuated, but only if the motion of the vessel continues. When the retchings continue or return after free vomiting, a ropy mucous fluid, mixed with more or less bile, is evacuated, owing to the emulgent operation of the retchings on the liver, gall-bladder, and ducts, thereby producing a favourable influence on certain diseases noticed hereafter (§ 26.).

23. The severity and duration of sea-sickness depend much upon the susceptibility of the individual; and the extent of motion to which he is subjected; and, although generally all persons are liable to sea-sickness on first going to sea, yet its severity and continuance are great in proportion to weakness and delicacy of constitution. Usually, however, the sickness either subsides or ceases altogether in a few days; and in previously healthy persons it is followed by a good or craving appetite, and a return of health, although the cause of the suffering may continue. Many persons who, from frequent or prolonged voyaging, have become exempt from sea-sickness, at least whilst at sea, experience a recurrence of it when they return to sea, after having passed a considerable time on land; but it is usually of short duration, or slight in these persons. Sea-sickness occurring during a short passage, as in crossing the Channel, immediately ceases with the stillness of the vessel, or on landing, vertigo only remaining for a time. Some delicate persons, who are very susceptible of sea-sickness, are also liable to nausea and vomiting from the motion of a carriage, especially while they remain inside, but escape from the sickness when they ride outside.

24. ii. Prognosis.—Sea-sickness, although mentally and physically most depressing, and although both vomitings and retchings are most severe, is generally unattended by danger, and it very rarely terminates fatally. When this event takes place, it is more the consequence of the continued nausea, and of the loathing of all kinds of ingesta, owing to their inducing retchings, and of the resulting inanition, exhaustion and fatal sinking, than of any alteration of structure, or contingent lesion, produced by the severity of the retchings. In all cases, where this species of sufferings is prolonged by severe weather, and susceptibility or peculiarity of constitution, more or less debility, exhaustion, inanition, anæmia and loss of flesh are observed; but generally, as soon as the cause ceases, or even considerably subsides, as on the occurrence of fair weather after storms, or on landing, these effects soon disappear, and are often followed by restored health, or even by an improved state of health, owing to the circumstance noticed above (§ 2.).

25. iii. The nature of Sea-sickness has been a subject of frequent discussion. The brain, the heart, and the cerebro-spinal nervous system generally, have been severally referred to as the seat of this distressing disorder. That these are more or less affected during its continuance — that the brain and nervous system are impaired in volition and in the vigorous discharge of all their functions, mental and physical, cannot be doubted; and that the heart acts feebly, although sometimes rapidly, but without tone or vigour, is equally manifest, until the retchings and vomitings occasion more or less reaction, accompanied with perspiration, which varies with the severity of the sickness, and the constitution of the patient. But the affection of these — of the cerebro-spinal nervous system and of the vascular and muscular systems, with the organs and parts more immediately concerned in the act of retching — is the necessary result of the effect produced by the motion of the vessel upon the semilunar and allied ganglia, and the viscera they endow with the organic nervous force. This effect continues until retching and vomiting supervene and occasion more or less reaction according to the constitutional powers of the sufferer. That the primary influence of the vessel's motion on the semilunar and allied ganglia is depressing may be inferred from the distressing sense of sinking referred to the epigastric region, and from the general physical and mental prostration preceding the retchings. That vomiting and retching, each varying in grade and character, follow very powerful depressing influences, is shown by the effects of most sedative and exhausting agents

—whether poisonous, morbid, or infectious—which act more especially or immediately on organs or surfaces endowed by the organic nervous force. It may therefore be inferred, that the vital depression produced by the vessel's motion is the chief cause of the sickness and vomiting, the irritation caused by matters contained in the stomach during this depression merely aiding in developing the retching and vomiting, this act and the evacuation of the stomach affording a slight temporary relief, the depression and sickness still continuing more or less, or for a period, according to the continuance of the cause, and to the constitution and predisposition of the sufferer.

26. iv. The Remedial Influence of Sea-sickness is sometimes remarkable in several diseases, more especially when the sickness is attended by free vomiting, the appetite returning afterwards, and when the patient does not suffer inordinately, or when the suffering is not long continued. In severe *hooping cough*, especially in persons near or past puberty, and even in infants and children, sea-sickness is often of marked advantage. In this complaint, the patient, sufficiently protected from exposure or weather, may be placed in a rowing or sailing boat, when much swell of the sea is observed, and carried out to sea, until vomiting takes place, when a return to land may be directed. In other cases and circumstances, a short voyage in sailing vessels furnishing the requisite accommodations, may be taken with benefit. A similar advantage may accrue in cases of *tubercular consumption*, as I have shown in that article (§ 420.); in *hæmoptysis*; in spasmodic *asthma*; in *chronic bronchitis*; probably in some cases of *chronic diarrhœa* and of *dysentery*, when suitable accommodations are afforded, and in *torpid states of the liver*, &c. In these cases, the influence of nausea in lowering vascular action and removing spasm, and the action of retching and vomiting in emulging the biliary apparatus (§ 21.), and in evacuating mucous accumulations in the bronchi, are of essential service. By this action also congestions of the lungs and liver are removed, or are aided in their removal, and a healthy secretion of bile promoted—circumstances of great importance in several pulmonary, biliary, hypochondriacal, gastric and intestinal diseases.

27. V. The Retchings and Vomitings which may be viewed as idiopathic or primary, and which are not necessarily connected with inflammation or structural disease of the stomach and allied viscera, although they ultimately, by persistence in their cause, become thus associated, are those which take place in the morning, and which either recur frequently or habitually, and which the patient generally removes for the time with a glass of brandy, or of brandy and water, or of some other favourite liquor. In these cases, morning sickness is the result of exhaustion from previous over stimulation, and for a time is merely functional, but sooner or later it becomes more and more structural. The same form of sickness often follows in the morning heavy suppers, either with or without excessive drinking. The circumstance of a person complaining of sickness or vomiting habitually or frequently in the morning, and more especially if he have recourse to spirits to remove it, before any food can be taken, is most positive evidence of such person being an incurable drunkard, although he may never have been intoxicated.[*] The form of disorder may be considered as allied to *vomiting from sea-sickness* (§§ 21. *et seq.*), the most idiopathic form of vomiting.

28. When the functions of the stomach are exhausted by the excessive excitements of intoxication, or by the irritation of indigestible or unwholesome food, and more especially by the ingestion of substances which readily enter into the acetous, the lactic, or the vinous fermentations, when received in the weak and exhausted stomach, then pain, vomiting or eructations are produced by the gaseous products, by the acidity, and by the various irritating matters and combinations, resulting from the fermenting substances, which, if they fail in undergoing these processes during the imperfect digestion, experience putrefactive changes, and occasion the same, or even more serious and more obstinate disease.

29. When the digestive processes are impaired or exhausted, owing to general DEBILITY (*see that article*, § 15. *et seq.*), or to inordinate muscular or mental exertions, or to local or constitutional disease, the articles of food most prone to undergo fermentation, as bulky vegetables, raw fruits, fermented bread and liquors, &c., produce an increase of disorder, by the fermentation which ensues, and the frequent repetition of such disorder at last passes into more serious disease, which is characterised by recurrences of retching and vomiting, and by gastrodynia, whenever such

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[*] The following cases will illustrate this. A young man in a large wine merchant's house, and having free access to extensive wine vaults, was seized, after habitual sickness and vomiting in the morning, with most violent pain in all the smaller joints, and especially in the wrists and ankles. He came under my care, when he confessed, that sickness and vomiting every morning upon getting out of bed had continued for three or four years; that it was instantly cured by a glass of brandy, but that he could take little or no breakfast. As soon as he returned to business in the morning, he continued drinking at intervals sherry or port wine or brandy, as either came in his way, and he thus took from two to three bottles of wine, besides brandy every day, unless Sunday, when his supply was not so liberal. He recovered his health, relinquished this habit. and he has for very many years been sober and temperate. He never evinced any symptom of disease of the stomach or liver, and he is the only instance I can recollect of a complete reformation from drunkenness.

A cook in my family was always sick and retching in the morning, and could take no breakfast. Her principal meal was supper; soon after which she retired into her own room, and nothing was known of her until she had partly recovered from her sickness and resumed her morning duties. Upon hearing this I became alarmed at the probable consequences of her after-supper indulgence, and means were devised to prevent her apartment from being fastened on the inside, and then she was there found drunk. These cases are not of infrequent occurrence; but in some instances vomiting is only occasionally present, chiefly in the morning; a chronic diarrhœa, sometimes passing to a fatal dysentery, with diseased liver, taking its place.

Several cases of very young persons, mostly females, who have died from the excessive use of spirituous liquors have been brought under my notice. These were characterised by habitual sickness and retchings in the morning, which were allayed by the accustomed stimulus or by strong tea, but followed, after a longer or shorter period, by enlarged and fatty liver; or by emaciation, chronic diarrhœa or dysentery, with ulcerated bowels; or by the most violent pains in the extremities, of a mixed neuralgic and gouty or rheumatic character, terminating in several of the cases before the age of twenty. In one fatal case, at the age of 17, the growth was remarkably stunted owing to this vice, all the others who had commenced it at an early age being very much under size. In this instance the fatty liver filled almost the whole abdomen, and descended deep into the pelvis, and produced an abdominal enlargement as great as the full period of pregnancy.

(§ 5.), and that occurring at the commencement of the fevers, and pestilential maladies already noticed; but the most distressing attacks of retching and vomiting are often caused by the *motions of vessels at sea*, and by *organic lesions of the stomach itself*. Of the former, a more particular notice will be taken in the sequel under the head of SEA-SICKNESS, or *vomiting and retching during voyaging by sea*; and as to the latter causes, viz. inflammation and structural changes of the STOMACH (§§ 22—95.), the symptoms now being considered, when arising from these lesions, are duly noticed at that place. To what I have there stated, and to the article on the pathology of the DIGESTIVE CANAL (§§ 37—43.), I must refer the reader. But there are other remarks which may be adduced at this place calculated farther to elucidate the history of vomiting.

13. i. VOMITING AND RETCHING FROM ORGANIC LESIONS *seated in, or implicating, the stomach.* — These lesions have been described at the places now referred to; and, amongst these, *ulcerative perforation of the stomach*, either commencing in this viscus, or extending to it from structural changes in adjoining parts, has occupied a conspicuous rank. These perforations may give rise, owing to previous agglutination or adhesion of the opposite serous surfaces, to communications— 1st, Between the stomach and the substance and vessels and ducts of the liver, owing most frequently to abscess in the latter viscus; — 2d, Between the stomach and the pleural cavities and lungs; — 3d, Between the stomach and pericardium; — 4th, Between the stomach and vena cavæ; — 5th, Between this organ and portal vein; —6th, Between the stomach and external surface of the abdomen; — 7th, Between this viscus and the gall-bladder; — 8th, Between the stomach, gall-bladder, and duodenum; — 9th, Between the stomach and duodenum; — 10th, Between the stomach and some part of the small intestines; — 11th, Between the stomach and colon; — 12th, Between the stomach and peritoneal cavity. Other fistulous communications between parts of the digestive canal and other viscera are met with on rare occasions, and are occasionally attended by vomiting; but they are noticed in their appropriate places. Of the several kinds of perforated communications between the stomach and other viscera now enumerated, the *first* is most commonly the result of abscess in the liver; although it may arise otherwise in rare instances, as in a case which came under my care where the perforation of the stomach extended far into the substance of the liver. The *second* is also most frequently the result of an abscess opening into the stomach. The *third, fourth, fifth,* and *sixth*, almost in all cases, are referable to perforating ulceration, cancerous or simple, commencing in the stomach. The *seventh* and *eighth* forms of fistulous communication are most commonly caused by large gall-stones in the gall-bladder. The *ninth, tenth,* and *eleventh* most frequently proceed from cancerous or simple ulceration commencing in the stomach or pylorus. The last of these lesions are caused chiefly by the absence of adhesion of the opposite peritoneal surfaces, which adhesion takes place in the others, although it is weaker, or more readily separated, in the cancerous or malignant, than in the simple, forms of ulceration. Of these forms of fistulous communications between the stomach and other viscera, *gastro-colic fistula* is probably the most frequent. This form has been ably described by Drs. BRINTON and MURCHISON, and references have been given by them to interesting cases, published in medical journals, and to preparations contained in the principal pathological collections.

14. ii. VOMITING FROM GASTRO-INTESTINAL FISTULA. — The *vomiting* caused by an *abscess* in the liver, or by abscess from diseased vertebræ, opening into the stomach, or by a communication with *purulent collections* in the pleura or lungs, or in any other situation, may be recognised by the history of the case, and by the purulent characters of the rejected matters. When occasioned by *cancerous ulceration*, or *growths*, the vomitings, with the antecedent and attendant symptoms, are described at the places above referred to. But when perforation of the stomach, either from these lesions, or from other ulcerative processes, takes place, then the vomitings frequently assume distinctive characters, which indicate the nature of the mischief. In cases of *gastro-colic fistula* the matters vomited very frequently indicate, or at least render probable, the existence of lesion from either cancerous or simple ulceration. In a very able memoir on this subject, Dr. MURCHISON has adduced 33 cases, of which 21 were caused by cancer, and 9 or 10 from simple ulceration. As to these he remarks, "that the proportion of cases resulting from cancer is more than double that from simple ulceration; and, as simple ulcer of the stomach is about five times as common as cancer, Dr. BRINTON was not far wrong when he conjectured, 'that its proportion in the malignant disease is at least thrice (and probably six to ten times) as great as in the ulcer.' This accounts for the fact that some pathologists, as ROKITANSKY and BOCK, speak of it as a result of cancer of the stomach, but make no mention of it under the head of simple ulcer.'" Had Dr. MURCHISON consulted what I have stated on this subject in the article STOMACH, and in the chapter on "*Ulceration and Perforation of the Stomach*," he would not have asserted that pathologists "make no mention of it (gastro-colic fistula) under the head of simple ulcer." This may be true as respects the foreign pathologists whom he has referred to; but if he will turn to p. 919. of the *third volume* of this work he will find, amongst other remarks, pertinent to this subject, the following:—"The ulceration may be *cicatrised*, as shown in the article just now referred to, (§ 39.) or it may proceed onwards after adhesions have been formed between the opposite portions of the peritoneal membrane, and thus the ulceration may proceed not only to perforation of the stomach, but also to perforation of a contiguous portion of the digestive canal, as the colon, or to more or less ulceration and perforation of another organ:" and I proceed to further illustrate the subject; and, in the following paragraphs, to describe the commencement and course of ulceration and perforation of the stomach, the several varieties they present, and the symptoms which they occasion.

15. This greater rarity of gastro-colic fistula, as a sequela of simple ulcer, may, according to Dr. MURCHISON, "depend on three causes:— viz., the fact, that simple ulcer is much more rarely met with in that part of the stomach nearest the colon — the great curvature (in 5 only

of 220 cases); and that there is a greater tendency in cancer to contract adhesion to neighbouring parts before perforation; while, at the same time, the cementing matter is of a less permanent quality than the lymph thrown out in the vicinity of a simple ulcer." The absolute frequency of gastro-colic fistula, as a sequela of *cancer* of the stomach, can only be approximated. Dittrich observed this lesion in 6 out of 160 cases, or in 3·75 per cent.; Dr. Brinton in 11 out of 507 cases collected by him, or in 2·17 per cent. That the ulceration generally commences in the stomach, I have shown in the places above referred to, but I have admitted that it may originate in the colon or other parts, and extend by perforation into the stomach. The cases recorded by Dr. Murchison fully illustrate this inference. He remarks that, "Out of the thirty-three cases, there is every reason to believe that the disease commenced in the stomach in twenty-six; in four cases there are not sufficient data for forming an opinion on the point; and in three only does the disease appear to have been most advanced in the colon after death." In cases where tubercular disease or abscess finds its way into the stomach or into both stomach and colon, as in very rare instances, when this result has occurred from disease of the kidney or the gall-bladder, the course of the alteration is manifest.

16. iii. The Diagnosis *of gastro-intestinal*, or *gastro-colic fistula*, depends chiefly on the characters of the matters thrown off the stomach. This topic is partly discussed, especially as respects the antecedent and many of the existing symptoms, in the articles referred to above; but those phenomena which indicate the presence of this fistula have not been so fully described. *Vomiting* is always present, although it sometimes recurs only at intervals. It is often preceded, and attended, by fœtid eructations, or by bilious, dark, or grumous matters in the ejected fluids. When there is a free communication between the stomach and intestine, the vomited matters generally are more or less fæcal. But where the fistula is long or circuitous, vomiting of fæcal matters may not, or only occasionally, be observed. Dr. Murchison remarks that out of nineteen cases in which the history was clear, fæcal vomiting was observed in eleven, and fœtid — perhaps fæcal — in three; and he draws the following conclusions: — "1. Fæcal vomiting is probably present in all cases in which the opening (except this be very minute) is situated in the fundus, or great curvature, of the stomach, and may also be present when the disease is in the pylorus. 2. In all cases in which food is vomited the opening is at or near the pylorus, so as to preclude the passage of food." In cases of cancer of the pylorus or duodenum, vomiting may be less after the formation of the fistula than before, as the food in the former case may pass into the intestine, into which the fistula opens.

17. Where gastro-intestinal or colic fistula exists there may be present eructations with a fæcal odour, as well as fæcal vomitings; or there may be only fœtid eructations. Next to fæcal vomiting, the presence of indigested food in the stools is an important indication of gastro-intestinal fistula. I have long supposed that at least some of the cases of *lientery*, amongst the many which came before me at the Infirmary for Children, were actually instances of this form of fistula. As the disease advances, as it usually does, to a fatal issue in the course of several days, (although it is sometimes prolonged to some weeks or even months, with intervals of partial ease,) diarrhœa with indigested matters in the stools soon after they had been taken, or an occasional recurrence of costiveness, emaciation, anæmia, general cachexia, or yellowness of the body, as described in the articles already referred to, are commonly observed.

18. III. Vomiting and Retching from Sympathetic Irritation. — Irritability of the stomach, so great as to be attended by vomiting or retching, on receiving all, or most kinds of food or drink into the stomach, is often occasioned by vascular erythism, inflammation, or organic alterations of an adjoining or even of a distant organ or part. The vascular excitement of, and determination of blood to the uterus during *pregnancy*, and the death of the fœtus in utero in the advanced months of gestation, are often productive of vomitings or retchings; and organic and inflammatory diseases of the uterine organs frequently occasion the same symptoms, especially in delicate and susceptible females, or when those diseases are of an acute or severe kind. As may be readily inferred, inflammations and organic lesions of any of the allied or adjoining viscera very often are productive of vomiting, the rejected matters consisting, as in the preceding diseases, chiefly of the ingesta, and of watery, ropy, and mucous fluids, sometimes coloured with bile, unless when congestion, inflammation or abscess, may give rise to the discharge of blood or purulent matter from the stomach, or from adjoining parts, communicating with the stomach. Enlargements, morbid growths, or other lesions, in the liver, spleen, pancreas, mesentery, omentum; disease of the diaphragm, or of the gall-bladder and ducts; misplaced or suppressed or retrocedent gout; suppression of urine, or retention of this excretion, verminous diseases, &c., severally occasion vomitings when they reach an advanced stage of development.

19. In some serious organic diseases of the brain, vomitings sometimes occur, and occasion, in both children and adults, in the latter especially, much difficulty in determining the true cause and morbid relations of this symptom, which, however, may be readily ascertained in most instances from the history of the case, and by estimating the succession and grouping of the accompanying phenomena. Diseases of the stomach itself, especially of the pylorus, duodenum, and of the intestines, particularly of the small, of the liver and gall-bladder — more especially when the concave surface of the liver is much affected — and of the kidneys, are frequently attended by vomiting: and when gall-stones irritate the gall-bladder or ducts, or are passing along the latter, the vomitings and pain are then very distressing. The irritation of calculi in the kidneys, or in their pelves, or when calculi are passing along the ureters, produces the same distressing symptoms; but the most urgent and dangerous vomitings occur in obstructions of the bowels, especially of the small intestines, from internal or external strangulation, from intus-susceptions, from inflammations.

various mechanical or structural causes of intestinal obstruction, as shown in various places (*see Arts.* Colic and Ileus, Concretions, Biliary and Intestinal, &c.); more particularly when the vomitings are attended by fœtid eructations, and when the vomited matters present a fœtid or fæcal odour, or a more unmistakable fæcal character. In all cases of obstruction, and irritation, of any of the ducts and canals within the abdomen, especially when the obstruction is caused mechanically or by a solid body, the sympathetic occurrence of vomiting is generally very urgent and distressing, although often presenting intervals of comparative ease. In all cases of vomiting and retching, the history of the case should be ascertained as fully as possible.

20. Besides these more strictly local diseases, which are attended by vomitings and retchings, there are several constitutional maladies, especially those adverted to above (§§ 18, 19.), in which these symptoms are of a most prominent character, and proceed from contamination of the blood, acting both on the frame generally and upon the stomach and its allied viscera in particular. No doubt that in all these maladies, whether the choleric and hæmagastric pestilences, or the contamination occasioning malignant puerperal fevers, or that arising from poisoned wounds, inoculation, &c., the morbid impression is primarily and energetically made upon the organic nervous system, the retching and vomiting often following closely upon it; but nevertheless, this impression being made, the alteration produced in the blood aids it, and promotes both by increasing the depression of the organic nervous force, and by irritating the stomach and adjoining parts, thereby rendering the vomitings of a more serious, dangerous, or obstinate character, as evinced in these maladies.

21. IV. Vomiting and Retching from Sea-Sickness are common to all persons soon after they feel the motions of vessels on the sea, if they have not acquired an immunity from this suffering by habit.

22. i. Description.—In some, vomiting is preceded by a prolonged nausea, with extreme prostration, faintness, vertigo, and apathy. In others, vomiting takes place more or less quickly, after nausea is first felt; and in many the nausea and distressing retchings, with headache, vertigo, and prostration, continue or return at shorter or longer intervals after the stomach has been completely evacuated, but only if the motion of the vessel continues. When the retchings continue or return after free vomiting, a ropy mucous fluid, mixed with more or less bile, is evacuated, owing to the emulgent operation of the retchings on the liver, gall-bladder, and ducts, thereby producing a favourable influence on certain diseases noticed hereafter (§ 26.).

23. The severity and duration of sea-sickness depend much upon the susceptibility of the individual; and the extent of motion to which he is subjected; and, although generally all persons are liable to sea-sickness on first going to sea, yet its severity and continuance are great in proportion to weakness and delicacy of constitution. Usually, however, the sickness either subsides or ceases altogether in a few days; and in previously healthy persons it is followed by a good or craving appetite, and a return of health, although the cause of the suffering may continue. Many persons who, from frequent or prolonged voyaging, have become exempt from sea-sickness, at least whilst at sea, experience a recurrence of it when they return to sea, after having passed a considerable time on land; but it is usually of short duration, or slight in these persons. Sea-sickness occurring during a short passage, as in crossing the Channel, immediately ceases with the stillness of the vessel, or on landing, vertigo only remaining for a time. Some delicate persons, who are very susceptible of sea-sickness, are also liable to nausea and vomiting from the motion of a carriage, especially while they remain inside, but escape from the sickness when they ride outside.

24. ii. Prognosis.—Sea-sickness, although mentally and physically most depressing, and although both vomitings and retchings are most severe, is generally unattended by danger, and it very rarely terminates fatally. When this event takes place, it is more the consequence of the continued nausea, and of the loathing of all kinds of ingesta, owing to their inducing retchings, and of the resulting inanition, exhaustion and fatal sinking, than of any alteration of structure, or contingent lesion, produced by the severity of the retchings. In all cases, where this species of sufferings is prolonged by severe weather, and susceptibility or peculiarity of constitution, more or less debility, exhaustion, inanition, anæmia and loss of flesh are observed; but generally, as soon as the cause ceases, or even considerably subsides, as on the occurrence of fair weather after storms, or on landing, these effects soon disappear, and are often followed by restored health, or even by an improved state of health, owing to the circumstance noticed above (§ 2.).

25. iii. The nature of Sea-sickness has been a subject of frequent discussion. The brain, the heart, and the cerebro-spinal nervous system generally, have been severally referred to as the seat of this distressing disorder. That these are more or less affected during its continuance — that the brain and nervous system are impaired in volition and in the vigorous discharge of all their functions, mental and physical, cannot be doubted; and that the heart acts feebly, although sometimes rapidly, but without tone or vigour, is equally manifest, until the retchings and vomitings occasion more or less reaction, accompanied with perspiration, which varies with the severity of the sickness, and the constitution of the patient. But the affection of these — of the cerebro-spinal nervous system and of the vascular and muscular systems, with the organs and parts more immediately concerned in the act of retching — is the necessary result of the effect produced by the motion of the vessel upon the semilunar and allied ganglia, and the viscera they endow with the organic nervous force. This effect continues until retching and vomiting supervene and occasion more or less reaction according to the constitutional powers of the sufferer. That the primary influence of the vessel's motion on the semilunar and allied ganglia is depressing may be inferred from the distressing sense of sinking referred to the epigastric region, and from the general physical and mental prostration preceding the retchings. That vomiting and retching, each varying in grade and character, follow very powerful depressing influences, is shown by the effects of most sedative and exhausting agents

—whether poisonous, morbid, or infectious—which act more especially or immediately on organs or surfaces endowed by the organic nervous force. It may therefore be inferred, that the vital depression produced by the vessel's motion is the chief cause of the sickness and vomiting, the irritation caused by matters contained in the stomach during this depression merely aiding in developing the retching and vomiting, this act and the evacuation of the stomach affording a slight temporary relief, the depression and sickness still continuing more or less, or for a period, according to the continuance of the cause, and to the constitution and predisposition of the sufferer.

26. iv. THE REMEDIAL INFLUENCE OF SEA-SICKNESS is sometimes remarkable in several diseases, more especially when the sickness is attended by free vomiting, the appetite returning afterwards, and when the patient does not suffer inordinately, or when the suffering is not long continued. In severe *hooping cough*, especially in persons near or past puberty, and even in infants and children, sea-sickness is often of marked advantage. In this complaint, the patient, sufficiently protected from exposure or weather, may be placed in a rowing or sailing boat, when much swell of the sea is observed, and carried out to sea, until vomiting takes place, when a return to land may be directed. In other cases and circumstances, a short voyage in sailing vessels furnishing the requisite accommodations, may be taken with benefit. A similar advantage may accrue in cases of *tubercular consumption*, as I have shown in that article (§ 420.); in *hæmoptysis*; in spasmodic *asthma*; in *chronic bronchitis*; probably in some cases of *chronic diarrhœa* and of *dysentery*, when suitable accommodations are afforded, and in *torpid states of the liver*, &c. In these cases, the influence of nausea in lowering vascular action and removing spasm, and the action of retching and vomiting in emulging the biliary apparatus (§ 21.), and in evacuating mucous accumulations in the bronchi, are of essential service. By this action also congestions of the lungs and liver are removed, or are aided in their removal, and a healthy secretion of bile promoted—circumstances of great importance in several pulmonary, biliary, hypochondriacal, gastric and intestinal diseases.

27. V. THE RETCHINGS AND VOMITINGS which may be viewed as idiopathic or primary, and which are not necessarily connected with inflammation or structural disease of the stomach and allied viscera, although they ultimately, by persistence in their cause, become thus associated, are those which take place in the morning, and which either recur frequently or habitually, and which the patient generally removes for the time with a glass of brandy, or of brandy and water, or of some other favourite liquor. In these cases, morning sickness is the result of exhaustion from previous over stimulation, and for a time is merely functional, but sooner or later it becomes more and more structural. The same form of sickness often follows in the morning heavy suppers, either with or without excessive drinking. The circumstance of a person complaining of sickness or vomiting habitually or frequently in the morning, and more especially if he have recourse to spirits to remove it, before any food can be taken, is most positive evidence of such person being an incurable drunkard, although he may never have been intoxicated.[*] The form of disorder may be considered as allied to *vomiting from sea-sickness* (§§ 21. *et seq.*), the most idiopathic form of vomiting.

28. When the functions of the stomach are exhausted by the excessive excitements of intoxication, or by the irritation of indigestible or unwholesome food, and more especially by the ingestion of substances which readily enter into the acetous, the lactic, or the vinous fermentations, when received in the weak and exhausted stomach, then pain, vomiting or eructations are produced by the gaseous products, by the acidity, and by the various irritating matters and combinations, resulting from the fermenting substances, which, if they fail in undergoing these processes during the imperfect digestion, experience putrefactive changes, and occasion the same, or even more serious and more obstinate disease.

29. When the digestive processes are impaired or exhausted, owing to general DEBILITY (*see that article*, § 15. *et seq.*), or to inordinate muscular or mental exertions, or to local or constitutional disease, the articles of food most prone to undergo fermentation, as bulky vegetables, raw fruits, fermented bread and liquors, &c., produce an increase of disorder, by the fermentation which ensues, and the frequent repetition of such disorder at last passes into more serious disease, which is characterised by recurrences of retching and vomiting, and by gastrodynia, whenever such

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[*] The following cases will illustrate this. A young man in a large wine merchant's house, and having free access to extensive wine vaults, was seized, after habitual sickness and vomiting in the morning, with most violent pain in all the smaller joints, and especially in the wrists and ankles. He came under my care, when he confessed, that sickness and vomiting every morning upon getting out of bed had continued for three or four years; that it was instantly cured by a glass of brandy, but that he could take little or no breakfast. As soon as he returned to business in the morning, he continued drinking at intervals sherry or port wine or brandy, as either came in his way, and he thus took from two to three bottles of wine, besides brandy every day, unless Sunday, when his supply was not so liberal. He recovered his health, relinquished this habit, and he has for very many years been sober and temperate. He never evinced any symptom of disease of the stomach or liver, and he is the only instance I can recollect of a complete reformation from drunkenness.

A cook in my family was always sick and retching in the morning, and could take no breakfast. Her principal meal was supper; soon after which she retired into her own room, and nothing was known of her until she had partly recovered from her sickness and resumed her morning duties. Upon hearing this I became alarmed at the probable consequences of her after-supper indulgence, and means were devised to prevent her apartment from being fastened on the inside, and then she was there found drunk. These cases are not of infrequent occurrence; but in some instances vomiting is only occasionally present, chiefly in the morning; a chronic diarrhœa, sometimes passing to a fatal dysentery, with diseased liver, taking its place.

Several cases of very young persons, mostly females, who have died from the excessive use of spirituous liquors have been brought under my notice. These were characterised by habitual sickness and retchings in the morning, which were allayed by the accustomed stimulus or by strong tea, but followed, after a longer or shorter period, by enlarged and fatty liver; or by emaciation, chronic diarrhœa or dysentery, with ulcerated bowels; or by the most violent pains in the extremities, of a mixed neuralgic and gouty or rheumatic character, terminating in several of the cases before the age of twenty. In one fatal case, at the age of 17, the growth was remarkably stunted owing to this vice, all the others who had commenced it at an early age being very much under size. In this instance the fatty liver filled almost the whole abdomen, and descended deep into the pelvis, and produced an abdominal enlargement as great as the full period of pregnancy.

disease is aggravated by the ingestion, or commixture of fermentative substances. The connection of fermentation in the stomach with indigestion and vomiting, has been well discussed by Dr. TURNBULL, and although the doctrine of fermentation has been pushed too far by him, there can be no doubt of the importance of giving due consideration to changes of this nature, which certainly take place in the digestive canal, when the nature, the quantity, and the admixture of indigestible, saccharine, and putrescent substances are taken into the stomach during functional or structural lesions of the digestive organs. Persons addicted to the excessive use of intoxicating liquors, experience more or less fermentation in the stomach after the excitement caused by these liquors has subsided; and the products of the fermentation, acting on the exhausted organ, frequently produce that amount of irritation, which is manifested by nausea, retchings, vomitings and gastrodynia, and which the drunkard relieves by a recourse to the accustomed stimulus.

30. VI. VOMITING ATTENDED BY THE DISCHARGE OF THE SARCINA VENTRICULI. — In 1842 Professor GOODSIR described this remarkable production, and since that time many cases of this kind have occurred, most of which have been either observed or referred to by Dr. TURNBULL, of Liverpool. I have not observed more than three instances of this production in the substances vomited since attention was first directed to it, and these occurred in cases of organic disease of the stomach, in which the fermentative and putrefactive processes appeared to have been readily produced. The writer just mentioned has noticed thirty cases of *sarcina ventriculi* recorded by various authors, and has himself observed six. Of these eighteen had terminated fatally. He arranges these cases in four groups: — "1. Cases in which ulcers or cicatrices arising from them, or some other non-malignant disease of the stomach, obstructed the pyloric orifice. — 2. Cases of cancerous disease contracting the pylorus. — 3. Cases in which there was no disease of the stomach itself, but displacement or some other condition obstructing the pylorus. — 4. Cases in which the disorder may have been functional, recovery having taken place more or less perfectly." The analysis of these cases furnishes the following: — the disease is more common in males than in females, in the proportion of twenty-four to ten, and between the ages of thirty and fifty. Of the three cases which I saw two occurred in confirmed drunkards between forty and fifty-five years of age. In all the cases, vomiting was the prominent symptom; flatulent distension, offensive eructations, pain in the stomach, costiveness, emaciation, and anæmia being also present. According to Dr. TURNBULL, the sensation of "something alive in the stomach," was also experienced, but this was not remarked in any of the cases for which I was consulted. Dr. B. JONES found the urine alkaline, and this excretion has, in some instances, contained oxalate of lime and sugar.

31. VII. TREATMENT. — i. TREATMENT OF SYMPTOMATIC VOMITING AND RETCHING. — It is manifest that the treatment of retching and vomiting can only be successfully accomplished by a strict examination of the history of each case, and of its causes, extrinsic and intrinsic; and by ascertaining the particular category of causes to which each individual case should be referred — whether the vomiting has been occasioned — 1st, By the ingestion of an injurious or poisonous substance (see POISONS); — 2nd, Or by the invasion or accession of a febrile, exanthematous or pestilential malady. — 3rd, Or by disease of the stomach or bowels, or of some adjoining organ or part; — 4th, Or by sympathy with the irritation or structural lesion of a more remote organ; — 5th, Or lastly, by the abuse of intoxicating or stimulating liquors.

32. *A.* If the vomiting be caused by poisonous ingesta, it is obvious that the means advised in such cases in the article now referred to are required, conformably with the evidence obtained as to the nature of the poisonous substance which has been taken. To this extensive subject I can add nothing to what I have adduced in the article POISONS.

33. *B.* If there appear any reason to ascribe the vomiting to the invasion of an exanthematous, infectious or pestilential malady, especially when any such is prevalent or epidemic in the same locality, or when the vomiting is associated with shivering or any of the other symptoms of the invasion of any of these maladies, then the treatment advised for the accession of such malady ought to be adopted. (*See the treatment recommended on the accession of the* CHOLERIC, and HÆMAGASTRIC PESTILENCES *of* SCARLET FEVER, SMALL-POX, *&c.*)

34. It should, however, be recollected, that the vomitings accompanying marked vital depression, especially those occurring in, or characterising pestilential and malignant maladies, and in animal or fish poisons, and in contaminated states of the blood, admit not of being cured, or even mitigated, by depressing or sedative remedies, whether narcotic or anodyne, unless exhibited in small doses, and conjoined with stimulants, aromatics, and cordials. Opium, morphia, and their preparations, hydrocyanic acid, chloroform and hydrochloric æther, will produce little benefit unless they be given in the manner now stated. In these cases, opium and hydrochloric æther, when judiciously combined with other means, will sometimes be of service, but the hot spices, warm stimulants and cordials, prescribed in large doses, according to the malignancy of the case will be found the most efficacious. Thus large quantities of capsicum, brandy, and of other powerful stimulants, have been retained by the stomach in malignant and pestilential maladies, whilst sedatives and narcotics have been instantly rejected by it; and even the spirits of turpentine have been retained, both in these maladies and in the last stage of low fevers, as well as in similar states of disease, especially when the blood is contaminated and vital depression is extreme. I have seen these effects in numerous instances, since 1817, when I first employed these substances in the hæmagastric pestilence or yellow fever. In all these diseases the usual means of allaying vomiting had failed, and increased the vital depression, the sense of sinking and mental apathy, and therewith the vomiting; which symptoms generally terminated in a fatal pumping up, or rejection of the contents of the stomach, without retchings, but often with singultus, when sedatives and narcotics were employed.

35. *C.* It is obvious that the vomitings and retchings caused by inflammatory and organic lesions of the stomach and allied viscera, can be allayed only by means which will remove or alleviate the disease of which the vomitings are merely a symptom. In the less severe of these, a temporary aid may be obtained from the use of hydrocyanic acid, from opiates given with oleaginous demulcents and nitrate of potash, or the muriate of ammonia in very small doses, and from external derivatives. But creosote and the more heating substances, often of service in the opposite states of vomiting, are seldom of service in these. In cases of intestinal disease, the remarks now made are equally applicable; and where strangulation or obstruction from any cause exist in, or otherwise implicate, the intestinal canal, the removal of it is essential to the removal of the vomiting. (*See Arts.* COLIC and ILEUS, CONCRETIONS, BILIARY and INTESTINAL, DIGESTIVE CANAL, STOMACH, and INTESTINES, INFLAMMATION and ORGANIC LESIONS, &c.)

36. *D.* The retchings or vomitings caused by irritation, inflammation, and organic lesions of distant organs require careful examination and discrimination: and, although these sympathetic vomitings are often allayed, especially by demulcents conjoined with refrigerants and sedatives, or with hydrocyanic acid, or creosote, opiates, &c., yet the treatment should be mainly directed to the particular disease, or structural lesion, of which vomiting is a distressing symptom, whether it be seated in the brain, in the kidneys, uterus, or other part. When the irritating cause is a calculus, or concretion in the gall-ducts or bladder, or in the urinary apparatus, the means advised for these, under their respective heads, and warm anodyne fomentations, tepid or warm baths, are those which are most appropriate, although these may be conjoined, or alternated, with those which are most serviceable in allaying the vomiting (§ 34.). — Creosote is often of much benefit, when the stomach itself and its allied viscera are free from inflammatory and organic disease, and when the retchings are purely sympathetic; but it soon fails as a palliative when the primary or chief disease has not received due attention, or when it remains unsubdued. Moreover, creosote, when given in too large or frequent doses, is apt to increase inflammatory action when it exists, especially if it be of a sthenic or phlegmonous character. When the vomiting is attended by manifest asthenia, or vital depression or exhaustion, creosote, as well as stimulants, aromatics and cordials are frequently very beneficial.

37. *E. The vomitings, &c. attending pregnancy*, especially in the earlier months of this process, will often be palliated or prevented by the above means — by the combination of the alkaline or earthy carbons with infusions of calumba, cascarilla, and with tinctures of the same tonics, and with the addition of hydrocyanic acid, or small doses of opium, or of chlorodyne. In this class of cases, fermentation often accompanies the sympathetic irritability of the stomach, and developes this latter state into the act of retching or vomiting. In the more obstinate and severe cases, or when these means prove inefficacious, then creosote in pill or in mixture, combined, according to circumstances, with opiates, alkalies, &c. should be prescribed.

38. ii. TREATMENT OF SEA-SICKNESS. — This is a very hopeless subject, yet it is nevertheless one which should not be abandoned, for with care and judgment sea-sickness may be more or less alleviated and its duration abridged. The usual means employed for it are seldom of service and often tend to prolong the nausea, without ultimately preventing the vomiting. It is generally preferable, when the sufferer is young or even moderately strong, to partake of such food and drink as he may prefer, thereby to prevent ineffective retchings; and when free vomiting is accomplished, to take small and frequent doses of a suitable anodyne, in small quantities of fluid. Substances of large bulk, or even in moderate quantity, or gaseous fluids, by distending or filling the stomach, generally bring back the retching and vomiting. During the nausea, or even after it is moderated, the stomach is quite incapable of digesting alimentary substances; therefore their presence in the stomach acts only as an irritant of the weak and susceptible organ, and in a short time brings back the sickness and vomiting. Having, therefore, promoted a free evacuation of the stomach, in the way now advised, small doses, often repeated, of either hydrocyanic acid, or tincture of opium, or chlorodyne, or of chloroform, or of hydrochloric æther, may be given in small quantities of a demulcent mixture, which may be made agreeable by the addition of a few drops of an aromatic cordial. Creosote has been recommended, but its odour is disagreeable to many persons; but, when prescribed for sea-sickness either in the form of pill, or in a demulcent mixture, it should be given in small doses, or not exceeding half a minim for a dose, which may be repeated according to its operation. The demulcent and anodyne medicines may be given in any of the mint waters, especially when the patient is distressed by flatulence and eructations, and any cordial or aromatic may be added if sinking at the epigastrium or vital depression be experienced.

39. Females and delicate persons, subject to sea-sickness, should retire to their cabins immediately on embarking, if the voyage be likely to be longer than a few hours, or to continue during the night. Unless the sufferer be weak, or extremely depressed by the sickness, retchings and vomitings, it is generally preferable for him to keep up and struggle against his enemy, as he will be the more likely to overcome ultimately, and to shorten the duration of the attack. If he have any return of appetite after vomiting, it should be indulged in great moderation, the food being the most digestible within his reach; if sickness and vomiting recur, they will generally be of short duration, and be followed by a return of appetite, which, if prudently indulged, will be generally followed by health. This plan is to be preferred if a long voyage, or one beyond three or four days be anticipated; for, by that time, or not much longer, the evil will cure itself. It is only for the more severe cases, or in short voyages, or for delicate females and weak persons, that the medical treatment advised above (§§ 38.) is either much required, or particularly appropriate.

40. iii. TREATMENT OF RETCHINGS AND VOMITINGS CAUSED BY DRUNKENNESS AND BY FERMENTING INGESTA. — The drunkard generally knows well how to remove the morning effects

corners in wet weather, or in damp mornings, upon plants or grass, and enter animals suited for their habitation and development with the food. By preventing sheep from being driven out in the morning till the dew is off the grass, or from grazing in wet swampy pastures, these animals are so far protected from *Strongyli* and *Distomata*. The origin of the thread worm, known as the *Filaria insectorum*, that lives in the bodies of adult and larval insects, could not be accounted for, and was referred to equivocal generation; especially as they contained no trace of sexual organs. But Von Siebold ascertained that they were not true *Filariæ*, but belonged to the peculiar family of thread worms, comprising the genera *Gordius* and *Mermis*; and that these parasites wander away when full grown, boring their way from within through any soft part of the body of their host, and thus creeping out. "These parasites do not emigrate because they are uneasy, or because the caterpillar is sickly, but from that same internal necessity which constrains the horse-fly to leave the stomach and intestine of the horse where he has been reared; or which moves the larva of the gad-fly to work its way out of the boils on the skin of oxen. The larvæ of both these insects creep out in order to become chrysalises, and thence to proceed to their higher and sexual condition." Now this desire to emigrate is implanted in very many parasitic insect larvæ, and the perfect full-grown, but sexless thread worms of insects, are in like manner moved by this desire to wander out of their previous homes in order to enter upon a new period in their lives, which ends in the development of their sexual organs.

10. As some kinds of parasites that have emigrated are never met with below a certain size, so some kinds that have already made their way into the interior of animals are not to be found under a certain size. It is known that many parasites do not enter into the animals in which they are to pass through their further stages of growth, until they have attained a certain degree of development elsewhere. This is particularly the case with such intestinal worms as remain parasitic in the last stage of their existence, viz., that of sexual maturity, whilst the *Gordiaceæ* quit their parasitical life, in order to become sexually mature away from the animal they have infested. During these early wanderings, the worms in question, Von Siebold remarks, commonly undergo a change of form, often accompanied by other phenomena of so highly remarkable and abnormal a character, as to render their metamorphosis or phases of existence almost incomprehensible. By degrees a mass of observations of remarkable metamorphoses of intestinal worms accumulated and formed a complete chaos of seemingly irregular phenomena, until the Danish naturalist, Steenstrup, succeeded in evolving a certain order out of this confusion, by the discovery therein of a hidden underlying law of nature, by which all the phenomena that had seemed so devoid of plan could be reduced to order. He named this law the "*Alternation of Generations*," and advanced two points of difference between it and *metamorphosis*; the first is, that the young of those animals which come under the former term are not only unlike their parent at first, but remain so; the second distinction is, that this young generation, so dissimilar to the parent animal, brings forth new creatures, which either themselves or their descendants revert to the original form of the first parent. Whereas, in simple metamorphosis, the dissimilar young pass by gradual changes into the likeness of the parent animal, and until this metamorphosis is complete are incapable of generation. Thus in the alternation of generation the parent animal produces dissimilar young, which Steenstrup terms "*nurses*," whose descendants only take her form. "A most important circumstance which characterises these *nurses* or '*Agamozooids*' physiologically is, that they bring forth young without themselves possessing any real sexual apparatus. Those agamozooids, in fact, multiply by division, by external or internal gemmation; they develope within their bodies germs which become new creatures. But these germs do not deserve the title of eggs, nor is the place where they are developed to be called an ovarium, since the germs which Von Siebold distinguishes by the name of 'sporulæ,' are not only devoid of the ordinary constituents of an ovum, a vitelline membrane, yolk, germinal vesicle, and so-called germinal spot; but the further development of the germ-body is not preceded by those conditions which are essential to the development of true ova within an ovarium. The organ in which, in certain agamozooids, the '*gemmæ*' are formed, cannot therefore be properly termed an ovarium, and I shall distinguish it by the name of '*sporularium*.' No 'nurses' present any sexual distinctions, and hence their method of multiplication and propagation, which takes place by means of sporulæ formed within sporularia, or by ordinary budding, or by division, must be arranged amidst the modes of asexual reproduction." (Von Siebold, *Op. cit.* p. 13, 14.) I must refer the reader to what this writer further remarks on the topic of alternation of generation, especially as it occurs among the *Trematoda* and *Cercariæ*.

11. From his researches, Von Siebold infers that certain sexually matured Trematoda — *Monostomum*, *Distomum* — generate young within their sexual organs, which are not developed into sexual individuals similar to their parents in form and structure; but that each embryo is converted into an animal of remarkably different form — into a *Cercaria*-sac, which has the nature of a sexless nurse, since without possessing sexual organs, it nevertheless generates young *Cercariæ*. These *Cercariæ* again differ from their parents, but gradually become sexually perfect, and in form and structure take the likeness of their grandparents. If we follow these *Trematoda*, which are subject to the alternation of generations, in their wanderings, we shall find that they meet with many obstacles to the completion of their developmental course, which is the entering into the viscera of an animal in which they can become sexually developed. The destruction of the various forms of *Trematoda* by the untoward circumstances to which they are liable, is compensated by the fact that they are furnished by the alternation of generations with the means of greatly multiplying the various developmental stages of their descendants; a sufficient number of individuals always remaining out of the numerous young of the nurses and larvæ, which achieve the propagation of their species.

12. The history of the *Cercariæ* explains many phenomena erroneously interpreted by the supporters of the doctrine of equivocal generation. It was

difficult to understand how living entozoa could have originated in the viscera of animals, sometimes in organs deeply seated or cut off from all external communication, and could there propagate their kind; the mode of origin—by equivocal generation—assumed for them, apparently accounting for the circumstance of these entozoa being unprovided with sexual organs. Frequently also, young or imperfectly developed intestinal worms were met with in the substance of organs, and were attributed to equivocal generation, "though in reality these *entozoa* were in the act either of emigrating, or immigrating, or else were tarrying until the creature they infested should be swallowed by some other animal, when the passive immigration for which they waited would take place. Many wandering parasites are unresistingly suffered to bore their way into and remain in the organs of animals, whilst certain kinds are stopped by becoming enclosed in a coagulable lymph thrown out by the organs they traverse." There are two kinds of cysts connected with parasitic worms: in the one the cyst is thrown out by the parasite itself, as in the case of the *Cercariæ;* in the other, the organ in which the encysted parasites lie embedded furnishes the walls of the cyst. In such cysts or capsules are found the most diverse kinds of intestinal worms, whose further course may be very various. "Many of the encysted young of intestinal worms experience no further change, but only remain for a longer or shorter period until such time as they may, together with their host, pass into the intestine of some animal of prey suitable for their future development. To this kind belong the Cercariæ already mentioned. There is also a small, imperfectly developed, round worm, hitherto always erroneously described as a perfect intestinal worm, under the name of *Trichina spiralis*, which remains a long time in its cyst without either growing or developing sexual organs. This minute Trichina spiralis is met with not only in the substance of the muscles of man, but also in the pleura and peritoneum of the most widely different kinds of vertebrate animals, enclosed in oval capsules about a quarter of a line in length." After a certain time of confinement is allotted to this little worm, and its deliverance not effected, it dies and undergoes a process of calcareous degeneration, its form being altered or entirely destroyed. Other encysted intestinal worms succeed in obtaining nourishment through the walls of their prison, and thus go on growing. Those, however, which are intended by nature to attain their sexual maturity only in the digestive organs of certain animals, cannot arrive at this condition in their cysts, and must, notwithstanding their further growth, fail in the attainment of the power of sexual propagation, until the animal they inhabit is devoured by the predaceous creature whose intestine is alone fitted to allow of the passage of these asexual intestinal worms into the last stage of their development. (VON SIEBOLD.)

13. From what has been stated we gather that those young intestinal worms which are developed at a distance from the nidus of their parents succeed, in the end, in reaching those situations where they may repeat the part of their progenitors, and reproduce their kind. The embryo parasites that have only just left their eggs disperse in all directions, so that they may immigrate into other animals, whenever an opportunity offers. Many thousands of these embryos of necessity never attain their object, owing to the numerous casualties they are liable to. However we may accept the facts displayed in the researches of VON SIEBOLD and others, it by no means follows, that the emigration or immigration of these parasitic animals is the result, as they suppose, of instinct. The parasite having arrived at the full stage of sexual development produces numerous ova, many of which necessarily are so circumstanced, by situation, dissemination, &c., as to admit of their passage through the different phases and metamorphoses of evolution and development: but that these changes, and the emigrations resulting from the circumstances common to all or most of them, admit of the inference that instinct has any thing to do with the phenomena; or that their temporary or continued residences, their journeys or passages from one place or animal to another—their migrations, &c., proceed from their possession of this endowment or principle, or that their migrations and residences are otherwise than altogether *passive*, cannot be received or credited without further evidence. But, after thus stateing a disbelief of the instinctive faculties of these parasites, the facts connected with their propagation and evolution become practically of importance.

14. Instead of viewing the migrations of the embryo or young parasites as passive, and the accidents connected therewith as equally so, VON SIEBOLD considers the former as altogether instinctive, and the latter as stray migrations. But, whilst altogether disbelieving that instinct has any thing to do with the matter, this writer's views deserve consideration. The point of most importance, he remarks, is "that these embryos should select, as their temporary residence, such creatures as will be consumed by those animals, whose intestines served their parents as a habitation and birthplace for their young. But many of these young, immigrated, intestinal worms will die without reaching the last stage of their development, in consequence of their host and involuntary carrier escaping from his natural enemies. Again, many embryos will be led *astray* by the migratory impulse (?), and pass into animals which never become the prey of those whose digestive canal is their goal." The embryos which thus "fail in their object," are here viewed as "*strayed* parasites;" and VON SIEBOLD remarks that "the *Trichina spiralis*, which is found in human beings, and which must be regarded as an encysted sexless nematoid worm, can hardly have found its way into the muscular structure of man, except by having gone astray: so also the *Cysticercus cellulosæ*, which not unfrequently appears in the muscles and other organs of man, and which is an asexual tænioid agamozooid. The *Cysticercus cellulosæ* changes to a sexual tape worm in the intestinal canal of certain mammals; the *Trichina spiralis*, after transportation to another and more favourable situation, will also become sexually developed." Many of the young of the intestinal worms, which only attain the last stage of their development in the digestive canal of the *vertebrata*, are said, by this writer, to pass, in the course of their wanderings, into the wrong organs [their instincts, I may infer, have not yet been fully developed or perfected!]; for instance, into

the muscular substance, the liver, or the peritoneum; here they remain undeveloped, whilst other individuals of the same brood, which have found their way into the intestines of the same animals, arrive at maturity. "The *Triænophorus nodulosus*, infesting fishes, offers an example of this, developing into a long sexually mature tape worm, in the intestines of pikes and perch, whilst, at the same time, these fishes often harbour other tape worms, which are, however, always sexless, in cysts in their liver. These last must certainly be also regarded as strayed parasites."

15. VON SIEBOLD believes that, in the bodies of vertebrate animals, the small embryos of intestinal worms bore their ways not unfrequently through the walls of the bloodvessels, and fall into the current of the circulation, and are carried thus to distant parts. Embryos of intestinal worms, to which the term of hæmatozoa has been given, have often been discovered in the blood of birds, reptiles, and fishes. These hæmatozoa never increase in size, nor become further developed in the blood, but often stick in the small bloodvessels of organs, which afford a more congenial soil for their further growth; and hence appear, on some occasions, worms in the brain, in the spinal marrow, and in the eyeball of man and animals. The *Cysticercus cellulosæ*, the *Cœnurus cerebralis*, and the *Echinococcus hominis* and *veterinorum* have been occasionally found in these situations, and have served as an argument for the doctrine of equivocal generation. "With the migrations and alternation of generation amongst the intestinal worms, two other phenomena are connected, which were formerly quite unnoticed, but which now have been generally observed. In the vicinity of those sexually perfect intestinal worms which, in their wanderings, are subject to the alternation of generations, only eggs, or recently hatched embryos, are met with; but the further stages of development are always wanting, since they first make their appearance after the emigration of the young to other places. Further, many of these intestinal worms, taken whilst in the act of migrating, are never found below a certain size, since they do not commence their wanderings, either as nurses or larvæ, until they have already reached a certain stage of their development." (*Op. cit.* p. 30.) Would it not be more correct to view these evolutions of parasites from germs and ova, and their passages, or passive migrations, during their development, as accidents connected with the numbers generated, and with the locations and transitions of the embryos; their development and sexual perfection being results of favourable circumstances which happen only to a few of the many generated; instead of viewing these migrations and their consequences as events produced by the instinctive endowment which VON SIEBOLD has conferred on these parasites? Whilst the possession of this endowment by these animals may be disputed, the facts adduced by this writer, respecting their origin, development, and alternation of generations, are more deserving belief and consideration.

16. II. THE CLASSIFICATIONS OF INTESTINAL WORMS have been so numerous and so different the one from the other, that an attempt to place them before the reader would not be consistent with my limits and with expectations of utility. Recent researches, also, have thrown doubts on the principles by which the older arrangements were guided; and the *orders*, *genera*, and *species* of *Entozoa*, which have been found in the animal kingdom, are so numerous as to prevent even a brief notice of them at this place. I must, therefore, refer the reader to the more recent works enumerated in the BIBLIOGRAPHY, and especially to those of Dr. JOY and M. FELIX DUJARDIN. Dr. KÜCHENMEISTER has given a classification of animal and vegetable parasites, which, as far as it refers to the *human Entozoa*, I shall, with some alterations, adopt.

17. I. Class, INFUSORIA. — II. Class, VERMES, HELMINTHIA. i. Order, PLATYELMIA. *A.* Sub-order, *Cestoidea*. (*a*) Genus, Bothriocephalus. (*b*) Genus, Tænia. *B.* Sub-order, *Trematoda* or *Trematoidea*. (*a*) Genus, Monostoma. (*b*) Genus, Distoma. — ii. Order, NEMATELMIA. *A.* Trichocephalus dispar, Trichina spiralis. *B.* Oxyuris vermicularis. *C.* Strongylus gigas, S. longivaginatus. *D.* Ancylostomum duodenale. *E.* Ascaris lumbricoides.

18. 1st CLASS.—THE INFUSORIA *are destitute of high organisation. They are simple, vitalised, membranous structures, which live by mere endosmose.* The *vibriones*, the *bursariæ*, *monades*, and *bodones* "are a peculiar attribute of fermenting and putrefying fœtid animal substances, or always presuppose a half-dead soil, and do not derive their nourishment so much from living substances as from matters which the living body has expelled, or are in the course of expelling as foreign to it; they are properly only to be regarded as indirectly parasitic upon the human body." FICINUS found sluggish bean-shaped Infusoria $\frac{1}{1000}$—$\frac{1}{1800}$ of an inch, and sometimes double this size, and of a globular form, in the perspiration of the feet, on the places where the epidermis was thrown off, as well as on the moist folds of the skin in young children; and others have met with them in purulent and foul secretions from the vagina, urethra, bladder, putrescible urine, &c.

19. i. *Trichomonas* (DUJARDIN). *T. vaginalis.* — "*Corpus nodulosum, gelatinosum, lacteum; cauda brevis; flagellum corpore triplo longius. Motus vacillans. Longit.* $\frac{1}{233}$." This parasite occurs only in women with gonorrhœal discharge, or with an abundant vaginal secretion containing mucous and pus globules, and never in a healthy vaginal secretion. KÖLLIKER and SCANZONI found it in the vaginal — never in the cervical — secretion of both pregnant and unimpregnated women, especially in the creamy and acid secretion, sometimes in the neutral, but never in the alkaline. Owing to its resemblance to the mucous corpuscles, it has been confounded with them. The body of this parasite is 0·01—0·018 millim. in length; the flagellum, 0·028—0·08 millim. in length; and furnished with 4—8 short cilia, in continual movement, which facilitate its recognition. The capability of infection by these Infusoria has not been determined, although very probable.

20. ii. *Denticola hominis* (FICINUS). "*Genus valde dubium*" (KÜCHENMEISTER). — This parasite, according to FICINUS, is an aciliated Infusorium, with the mouth on the ventral surface, and probably furnished with a carapace, resembling the *paramecia* and *kolpodæ*; but he considers it more allied to the *monades* and *vibriones*. The genus he believes to be numerous; and he infers

that every mammal has its peculiar species. Dogs and horses, he says, next to man, exhibit these Infusoria in abundance. He states that he found them especially in the interstices of the molars; more rarely on the mucous membrane of the mouth, scarcely in the saliva; but most abundantly where the teeth have been neglected, and in hollow teeth. They adhere, form filaments, and advance between the teeth and gums, pushing between the roots of the former and the latter, destroying their union. These effects are, however, prevented and remedied by the usual operations on the teeth, and by aromatic, tonic, astringent, and antiseptic dentifrices.

21. 2nd Class. — *a.* Vermes, Helmintha, are of the greatest importance to both the pathologist and the practical physician. The parasites belonging to this *class* are destitute of many of the organs possessed by the higher animals. They have no distinct respiratory organ; the oxygen necessary to their existence can only be taken up in their fluid food. Hence they are enabled to exist within the human body, either in its closed or open cavities, or in its tissues. "They constitute the true Entozoa, and furnish no representatives to the series of human *Epizoa,* although some of them may be destined, in the course of their development, to pass a portion of their lives in water, or perhaps (as in the case of the *Cercariæ*) as Epizoa upon other animals. Sexual organs may always be detected in those specimens of these animals which have attained their last grade of development." The senses of sight, smell, and taste are wanting in all these parasites, but their sense of touch appears to be highly developed. The intestinal canal is wanting in the *Cestoidea.* In the *Trematoda* it forms a cæcal canal, in which the mouth also performs the functions of the anus; whilst in the *Nematoidea* it becomes a complete alimentary canal, with a mouth, œsophagus, stomach, intestine, and anus. In the tissues of the *Cestoidea* is a tendency to the formation of an envelope of a calcureous nature, which is wanting in the *Trematoda* and *Nematoidea.* These three kinds of true Helmintha are characterised — 1st, By a general *sense of touch*; — 2d, By a *vascular system,* of four longitudinal lateral canals in the *Cestoidea,* and of a fine network of vessels in the *Trematoda,* which are less distinctly marked in the *Nematoidea*; — 3d, By a *muscular system,* composed of transverse and muscular fibres, without transverse striæ; — 4th, By the *structure of the epidermis,* which consists of a homogeneous finely checked substance, closely approaching the character of chitine; — 5th, By the *property of giving off a strongly refractive, albuminous substance,* in oleaginous drops, when in contact with water; — and 6th, By *their scarcely effecting their development without a passive and active migration of their embryos and immature young.*

22. *b.* As to the last of these characters, Küchenmeister, more rationally than was stated, as shown above, by Von Siebold, remarks that "this *migration* itself is passive during the embryonal state, and as long as the embryos are still enclosed in the egg-shells or envelopes, during which period they usually emigrate once, passively, into the external world, generally with the excrements of the hosts of their parents; and then again, passively in general, into the intestinal canal of the animal, in which they are to acquire a higher development. From the latter moment commences their active migration, by which they seek the situations, usually external to the intestinal canal, in which they are to undergo their metamorphosis into the next higher step or steps of development, which is generally accompanied by an encysting process. Finally, as a general rule, at least as regards the trematoda and cestoid worms, they must afterwards migrate, passively, once more into the intestine of the animal in which they are to attain maturity; that is to say, they must pass with the food of their new and final host into its intestine." (*Op. cit.* p. 4.)

23. *c. General pathology* shows that the worms cannot effect their active migration without causing some irritation of the regions through which they pass, whether this migration is performed by the youngest brood, as is usually the case, or by the more or less mature animal, as rarely occurs, and chiefly among the *Nematoidea.* The passive migration of all immature parasites into the human intestine takes place without any perceptible morbid phenomena.

24. *d.* The *general prognosis* of this class of parasites may be stated as follows: — 1st, The young animals engaged in their migration are the most dangerous; — 2d, Next to these, the migrating mature individuals, which inhabit the intestinal canal, produce the most dangerous symptoms; — 3d, The animals which reside in cysts or closed cavities can become dangerous only when they attain an enormous size; but, when small, they may be present without doing any mischief; — 4th, Most of the mature individuals are more accessible to curative means, than those of lower stages, especially those which live outside the intestinal canal.

25. *e.* The *principles of treatment for the Helmintha* are — 1st, The destruction or removal of the mature worms, and of their progeny; — 2nd, The observation of a rational prophylaxis, founded on the modes of life and migrations of the immature individuals; on the constitution and circumstances, and the habits and modes of life, of people subject to these parasites; and on a knowledge of the nature and peculiarities of the situations in which these plagues are endemic.

26. III. The animals of which I have now to treat belong to the *first sub-class* of Diesing—*Helmintha achæthelminthica: animalia evertebrata, inarticulata (i.e., extremitatibus articulis nullis prædita), nunc mollia, aut elastica, ebranchiata, setis retractilibus nullis.* I have, following Vogt, Virchow, and Küchenmeister, divided this class into two divisions — i. *Platyelmia,* flat worms; and ii. *Nematelmia,* round or thread worms; and again dividing the first section or order into — 1st, The *Cestoidea,* Vogt; the *Cephalocotylea,* Diesing; or the *Platyelmia colonias exhibentia,* or flat-worm colonies, of Küchenmeister; — and 2nd, The *Trematoidea,* Vogt; *Myzelmintha,* Diesing; or *Platyelmia isolata,* isolated flat-worms, Kuch.

27. i. Order, Platyelmia. — *Entozoa solitaria aut composita, androgyna. Corpus depressum vel teretiusculum, molle, organis ad fixandum aptis præditum. Anus nullus; canalis cibarius aut divisus (rarissime simplex), aut nullus. Cavitas corporis non distincta. Metamorphosis in plerisque; larvæ gemmiparæ aut sporaliparæ.* (Leuckart.)

28. *A.* Sub-order, Cestoidea. — *Cephaloco-*

tylea, Diesing; *Platyelmia composita, aut colonias exhibentia*, Plattwurm-Colonien, or flat-worm colonies, Küchenmeister; *Bandwürmer*, tapeworms—*Animalia tomotoca, per longum plerumque tempus larvæ nutrici juncta et una cum ea corpus elongatum, articulatum, polymorphum formantia. Larva* (Scolex, *vulgo caput*) *pyriformis, foveis aut osculis suctoriis quatuor vel duobus instructa, sæpissime unciata.* Proles sexualis (Proglottides, *vulgo articuli*) *organis externis destituta, embryones uncinulis armatos gignentes. Canalis cibarius nullus.* (Leuckart.)—*Quinque variæ inveniuntur in iis metamorphoses:*—1. *Animal maturum* (*Proglottis*); 2. *Embryones uncinulati* (Grand-nurse, *Grossamme*); 3. *Scolex passivam vitam agens sub forma vermis cystici seu Cysticerca, sub forma Platycerca, et sub forma Acerca*; 4. *Scolex activam vitam agens* (Nurse, *Amme*); 5. *Strobila.*

29. It is only recently that the *cystici*, or *hydatids*, have been shown to be only a stage in the development of the *Tæniæ*, and not to be a distinct family among the *Helmintha.* Hippocrates, Aristotle, and many anatomists and physicians up to the times of Redi and Hartmann—in 1683-5—regarded the *Cysticerci* as hydatids; but the distinct animal nature of these was not recognised until the work of Redi appeared; and not fully established until the researches of Tyson were communicated to the Royal Society in 1691. (*Philosoph. Trans.* No. 193. p. 506.) Pallas, in 1766, stated that all cystic worms are forms of tape worms, and belong to a single species—"*Tænia hydatigena*, cystic tape worm,"—which only presents some differences, especially in the caudal vesicle, according to the animal it inhabits. But neither Tyson nor Pallas, by the terms *Tænia hydatigena*, or *Lumbricus hydropicus*, given by them to cystic worms, expressed any opinion as to the genesis of these worms, or their derivation from ordinary tape worms. Goeze, in 1780, and Wagler, advanced but little the views of Tyson; and, although the subject of cystic worms was considered by Zeder and Rudolphi, it made no progress in their hands. At last, in 1842, Steenstrup's theory of the alternation of generations made its way, he believing that the cystic worms were early steps in the development of Helmintha, which were unknown to him. In 1845, in consequence of Steenstrup's discovery, Dujardin first asserted that the cystic worms were undeveloped animal forms, and young states of tape worms; and that they were produced from those germs of tape worms which, instead of the intestine, had got into the parenchyma of the body of their host, and under the influence of this unusual dwelling-place, had advanced to the abnormal state of development which is called a "cystic worm." Simultaneously, Von Siebold, in Germany, expressed the same opinion with Dujardin in France. At first, however, Von Siebold inclined towards Steenstrup's view, and said:—"In its form, its suckers, and its circlet of hooks, the head of the asexual cystic worms possesses such a striking similarity to the heads of certain tape worms, that one is tempted to believe that the cystic worms are nothing else than *undeveloped* and *larva-form* tape worms." He subsequently, nevertheless, arrived "at the most decided conviction that the *cystic worms are strayed tape worms which have remained undeveloped and become degenerated*, and of which the body grew out in the foreign soil into a vesicle, without developing sexual organs."

30. In 1850, Van Beneden, the Belgian zoologist, declared the vesicular worms to be larva-like, or young states (*scolices*) of *Tæniæ*, and compared them with the larvæ of *Tetrarhynchus.* According to him, the head of the tape worm (*scolex*) is produced from the egg of the tape worm. If an egg of a tape worm reaches the intestinal canal of an animal in which it may be further developed without interruption, the jointed mature tape worm (*strobila*) immediately grows from the egg in uninterrupted succession; but if it does not reach an intestine of this kind, a longer or shorter period of rest ensues in the further development as soon as it has arrived at the evolution of the head of the tape worm (*scolex*); in this case the anterior part of the head sinks into its inflated hinder part, and it becomes a *Cysticercus*, or a cysticercal animal form. Küchenmeister, however, finds two errors in this inference. 1st, It is not proved that a tape worm can pass through all the phases of its development in the intestines of its host; and 2nd, And just as little as the caudal vesicle is produced subsequently by dropsical degeneration (Dujardin and Von Siebold), does the ready-formed head sink into its inflated hind part, in order to become a *Cysticercus.*

31. As Goeze had suggested in 1780, Küchenmeister, in 1851, administered various cystic worms to different animals. For this purpose the latter selected the *Cysticercus pisiformis* of the rabbit, and also the *C. fasciolaris*, and gave the former to the dog and the latter to the cat, and in the intestines of both these animals he "succeeded in rearing tæniæ rapidly approaching maturity." From these experiments he makes certain deductions, of which the following are the most interesting:—1. The caudal vesicle occurs in all individuals of all species of cystic worms, even though they live in the most various zones and different animals. 2. The universal loss of the caudal vesicle has its analogue in the metamorphosis of many animals. 3. All cystic worms, in the earliest period of their existence, have the head constantly inverted towards the caudal vesicle. 4. The state of rest in which the cystic worms must live in the interior of their caudal vesicle, in order to their development, would be inconceivable, if they had to collect the nutritive fluid for themselves, and did not contain it in them. 5. The cystic worms are not strayed dropsical tape-worm nurses, but tape-worm larvæ furnished with a provisional organ (caudal vesicle), probably being a reservoir of nourishment, and incapable of sexual multiplication, for which there is neither room nor sufficient nutritive material. 6. The cystic worms constitute a necessary step in the development of the *Tæniæ.* 7. We cannot speak of dropsy or degeneration, and not even of straying, because we do not yet clearly perceive how the brood could get to the dwelling-place of the cystic worm. And 8. *Cysticerci*, when transferred to the intestines of other animals, do not become developed into jointed tape worms, unless the species of *Cysticercus* is suited to the intestines of particular animals; thus, the *Cysticercus pisiformis* was not developed in the intestines of the cat, but it was fully developed in those of the dog. Küchen-

MEISTER asserts that all eminent German zoologists now agree with him in believing "that every cestode worm, and not merely the *Tæniæ*, pass through a cysticercal state; that the cysticercal larva lives in various parenchymatous organs, and the free *scolex* (*strobila*) usually in the intestine of a different host; and lastly, that the tape-worm head (*scolex*) is produced in the interior of the previous embryonic body (*i.e.* the caudal vesicle), and remains enveloped by this until it gains the situation for which it is ultimately destined."

32. But to place beyond all doubt that the cystic worms were necessary steps in the development of *Tæniæ*, it was also requisite to prove their production from the embryos of the tape-worm brood. "It is true that the six characteristic embryonal hooklets have not yet been detected upon true vesicular worms, but we shall shortly see that the laws of analogy, as well as experiment, afford us a glance into this process." After various experiments, KÜCHENMEISTER proceeds to state that he resolved to resume those experiments with the *Tænia Cænurus* in order to obtain the remarkable phenomena of the vertigo in sheep. On the 15th of May, 1853, he obtained the *cystic Cænuri*; on the 25th of July mature proglottides of the *Tænia* were passed by the dog, to which the *Cænuri* were administered; and these, in order to make the experiment under the most unfavourable circumstances, were administered to a perfectly healthy two-year-old wether, a description of sheep which are usually free from *Cænuri*. On the 10th of August the sheep was vertiginous; and on the 13th it was necessary to kill the animal; and in the brain he found fifteen young vesicles of *Cænurus*, partly on the surface of the brain, which was reddened by inflammation, partly in the substance of the brain, and even in the ventricles. In January, 1854, six lambs were fed with *Tænia Cænurus*. Of these, five became vertiginous in about eleven days. LEUCKART fed, in October, 1853, a colony of white mice with *Tænia crassicollis*. In January, 1854, he examined his mice, and found them infested by cystic worms. KÜCHENMEISTER subsequently proved that, by the administration of mature species of *Tænia*, as far as they were accessible to him, to suitable animals, only the cystic worms belonging to these species can be reared; but not any kind of cystic worm at pleasure. From the concordant experiments of HAUBNER, LEUCKART, VAN BENEDEN, MÖLLER, and himself, KÜCHENMEISTER considers that this much is established:—

33. "1. Mature *Tæniæ* have hitherto been reared successfully from all vesicular worms administered when a suitable host was selected; thus, from *Cysticercus pisiformis* the *Tænia serrata vera* was obtained; from *Cyst. tenuicollis*, the *Tænia ex Cyst. tenuicolli*; and from *Cænurus cerebralis*, the *Tænia Cænurus*;—all three in the intestine of a dog: from *Cyst. fasciolaris*, the *Tænia crassicollis*, in the intestine of the cat: from *Cysticercus cellulosæ*, the *Tænia solium*, in the human intestine: from *Echinococcus veterinorum* (*Scoliciparians* of KUCHENMEISTER), a *Tænia Echinococcus*, in the intestine of a dog: and from *Cysticercus longicollis Hyperdæi*, the *Tænia crassiceps*, RUD., in the intestine of the dog (LEUCKART)."

34. "2. From the eggs of *Tænia solium* in pigs, from those of *T. Cænurus* in sheep and cattle, of *T. serrata vera* in rabbits, of *T. crassicollis* in rats and mice, of *T. ex Cysticerco tenuicolli* in sheep and lambs, the corresponding vesicular worms have been reared. The experiments with the eggs of the *Tænia* of *Echinococcus* have hitherto remained unsuccessful."

35. Up to a recent period it was the most general opinion, still entertained by some, that the tape worm (tape-worm chain) was a simple animal, with numerous segments. Nevertheless, some older physicians correctly perceived that tape-worms were not simple, but compound animals. By many, the several segments of *Tæniæ* were regarded as separate worms; and what DUJARDIN has recently called *proglottides* are described by them in the human tape worms as "*Vermes cucurbitini*." At the same time they fell into the great error of not regarding this chain as produced by a successive formation of joints placed one behind the other from the head, but expressed the remarkable opinion that the tape worm was produced by the adhesion of the individual "*Vermes cucurbitini*" one after the other, by which means the many-jointed body was formed. The opinion that the tape worm was a compound animal—an animal composition—was first expressed by LEUCKART. Soon afterwards, ESCHRICHT and STEENSTRUP expressed this opinion more strongly, and VAN BENEDEN proved it, after DUJARDIN had described the segments of tape worms which occur isolated, as peculiar animals, under the name of *proglottis*.

36. i. *The mature animal, or Proglottis.*—"From the moment that the hindmost segment or segments of a tape-worm colony has become so far developed as to contain the six-hooked brood ready formed and enclosed in the egg-capsules, this segment seeks to break loose, either by itself or in company with several others, in order to continue an independent existence, either in the same place (the intestine of its previous host), or in a different one (in the external world). All this varies according to the species. In *Tænia*, *Tetrarhynchus*, &c., each joint usually breaks loose; in *Bothriocephalus*, a series of joints." In those in which no regular formation of segments exists, no single proglottides or segments can break loose, but only single brood-places, or fragments of the body of the cestode worm with such brood-places; or the eggs must escape singly. The proglottides have for the most part a flat quadrangular form, very similar to the *Trematoda*, and usually a white or yellowish, rarely a reddish or brownish colour; they have neither mouth, anus, nor intestine. "As the eggs possess a much greater diameter than the vagina, they cannot pass through this, but can only escape out of the proglottis, when the vagina acquires a larger opening, by tearing, &c. This takes place sometimes even in the intestine of the first host, and the eggs escape separately into the outer world with the excrements, which then appear as if sprinkled with fine white sand; or immediately without the intestine, where the progress of the proglottis is seen indicated by a white milky streak. Sometimes the proglottis does not burst in either of the above-mentioned places, but gets uninjured into the intestine of a new host, in which case it distributes its brood only after it has been destroyed by digestion. According as the eggs reach the intestine of their host in this way separately, or inclosed in the proglottis, and there-

fore in a mass, solitary or numerous specimens of a cystic, or of the analogous state, are produced within one and the same host." The proglottides thus perform an *active* migration from the intestine of their previous host, and are *passively* or contingently transferred into the intestinal canal of a new host. With the dissemination of their brood, their function ceases.

37. ii. *The six-hooked brood, enclosed in separate egg-capsules.*—These are called eggs, although their development differs greatly from that of ordinary eggs. The embryos enclosed in the egg-shells are globular naked vesicles, unlike their parents; the smallest of them measure only 0·022 mill., and the largest, 0·05. They are destitute of any organs, possess an epidermis with a double outline, and usually bear six, but in the *Tetrarhynchi* only four, very small microscopic hooklets on their anterior extremity, so that they carry their destination, that of boring forward through the tissues, as it were, written on their foreheads. The bodies of these small but very dangerous vesicles, whether armed or unarmed, are always capable of motion. The embryos which are destined to migrate into cold-blooded animals are much larger, possess larger hooks, and exhibit distinct movements in the usual temperature of a room. Those destined for warm-blooded animals are much smaller, with smaller hooklets, and exhibit distinct movements only about the temperature of the stomach. (KÜCH.)

38. iii. *The destiny of the six-hooked brood when set free.* — *A. What is the fate of this brood until it reaches its settled dwelling-place external to the intestinal canal?*—As soon as the embryo becomes free in any part of the digestive canal of an animal which suits it, according to VAN BENEDEN, it brings together the central pair of its embryonal hooklets like a wedge, and at the same time, by thrusting and twisting, begins to force them forwards. Having in this way made a little progress, it assists itself further with the two lateral pairs of hooklets. KÜCHENMEISTER supposes that, having thus penetrated into the tissues, they pass into the blood-vessels, and thus they are conveyed either into the liver by the *vena porta*, and remain fixed in the finest ramifications of the blood-vessels, or into the brain, or into other parts. The migration of the young of the *Cestoidea* to the places where we meet with them as vesicular worms, or in analogous states, takes place in the following way: —

39. 1st. A portion of the six-hooked brood, in all species of *Cestoidea* may reach their dwelling-place directly and by active migration, by boring their way. 2nd. Others, by an uncertain duration of this migration, reach the vessels of the new host, penetrate these, and are conveyed with the blood to the smallest ramifications, where they (*a.*) either become developed in these ramifications, the walls of the vessel becoming their envelopes; or (*b.*) they migrate passively into the neighbouring tissues, after the rupture of the walls of the vessels, in consequence of the swelling of the embryo; or (*c.*) after being detained in these ramifications they enter anew upon an active migration, passing into the tissues by means of their hooklets, and increasing in size.

40. *B. What further takes place with the embryos when they have come to rest in their new dwelling-places? The third stage of the development of the Cestoidea,* consists of the so-called vesicular worms and their analogous asexual forms, "which, in accordance with the alteration which the embryonal vesicle undergoes in the different species of tape worms, and with the different animals infested by them, may be divided into *cysticercal* (vesicular worms), *platycercal* (forms with a flat, inarticulate, tail-like appendage), and *acercal* (or tail-less), forms. It is a common peculiarity of all the three forms here mentioned, *that they are cestode-heads produced from the embryonal vesicle, which occur still in the interior of the embryonal vesicle, or upon it in a state of rest.* We may therefore best comprehend this stage under the name of *resting scolices.*" The metamorphosis or transition of the embryos to the resting, and usually *cysticercal* scolices, may be stated as follows: —

41. 1st. "The embryo, still furnished with its six hooklets, begins to swell by the reception of fluid (liquid nourishment), which is secreted from the place in which it has established itself: this is at first a fluid similar to protoplasm, but after the formation of the enveloping cyst, or after the cessation of inflammation, when the creature lives free in the interior of serous cavities, it does not agree so much in its composition with the serum of the blood as with the ordinary products of the secretion of serous membranes." (LUSCHKA.)

42. 2nd. As soon as the embryo has in this way rather rapidly enlarged to a certain size, and arrived at a state of repose, the round vesicle thus formed, when it does not project freely into a serous cavity, and has not fallen into one, surrounds itself with an envelope, which protects it and assists it in procuring repose. These enveloping cysts constitute an absolutely new formation, which is analogous to serous membranes, and which constantly increases in size with the growth of the young cestode vesicle. When, however, the brood of a cestoid worm gets freely into serous cavities, it either never attains to this formation of an enveloping cyst, or does so at a rather late period, and at a time when the young embryo has become a vesicle of very considerable size, and often exhibits the Tænia head in an advanced state of development. In places where the young cystic worm again falls into repose, a fresh exudation of plastic matter adapted to the formation of cysts takes place, the walls of the cyst being rich in blood-vessels. (KÜCHEN.)

43. 3rd. By the reception of the secretion of the serous membranes, the young cestoid vesicle swells up. At its anterior end, and at the point where the six embryonal hooklets are situate, a funnel-shaped pit is at first formed, and this gradually penetrates more deeply into the parenchyma of the embryonal body. In the bottom of this pit the first traces of the head appear, whilst the lateral walls of the depression become converted into the body — the central body — of the future cystic worm, and the remaining portion of the embryonal vesicle, which is not inverted, or not implicated in the metamorphosis, becomes the so-called caudal vesicle. This inversion and first formation of the head most frequently commence at the anterior surface of the vesicle, and are seen distinctly in the cestodes of *Arion empiricorum*, for in these the six small hooks are placed in pairs at the point of transition of the central body into the caudal vesicle of the worm. The

central body and the head are always developed in the interior of the embryonal vesicle, and during the whole period of the vesicular state the head always has its apex directed towards the caudal vesicle, even when the central body, which encloses the head in the form of a hollow canal, has not sufficient room in the embryonal vesicle, but is pushed out of it. (KÜCHEN.)

44. 4th. From the experiments of HAUBNER, KÜCHENMEISTER, LEUCKART, ROLL, VAN BENEDEN, ESCHRICHT, &c., with the various *Tæniæ* which pass through a vesicular condition, the following appears:— According to LEUCKART, at least in experiments with *T. serrata*, we find twenty-four hours after administration the six-hooked embryos in the blood of the large abdominal veins, especially the vena porta; and on the fourth day, in the livers of rabbits to which they have been administered, small, white, clear vesicles of 0·3 millim. in diameter, but rapidly increasing in size, which, on the sixth, are already 1 mill. in diameter. In *T. serrata* the actual embryo, after the lapse of fourteen days, measures 1·5 millim.; in *Cænurus*, it is about the size of a grain of millet at this period. The small vesicle (the worm), after it has begun to grow clear, acquires, in its interior, numerous large clear enucleate vesicles, which, according to LEUCKART, are similar to sarcode drops. In the parenchyma we recognise a cortical layer, which becomes thinner, and the cells of which are converted into muscular envelopes by fibre-formation, and a medullary layer, in which elastic vesicles or cells occur in great quantity. From the appearance of the medullary substance, the growth of the little worm, which is capable of motion even before the muscular layer is developed, advances with rapidity. Even in the first fortnight, and shortly afterwards, the form of the young cestoid worm varies according to the species. Some, such as the younger *Cœnuri* and *Cystic. cellulosæ, tenuicollis*, and *fascicularis*, are spherical; others, such as *Cystic. pisiformis*, and probably also *Cystic. longicollis* and *fistularis*, are oval. Many of those seated upon the surface of organs, projecting into closed serous cavities, wander for a time in the organ, and finally fall into these cavities; the oval forms appearing to wander more than the round ones. About fourteen days after administration, the above changes take place almost universally and in all places. But those individuals which have not found a situation favourable to their development undergo a retrograde metamorphosis, passing "to the state of caseous, granular, or atheromatose masses, in which we may seek in vain for any remains of the embryo, although this certainly is present. Many cases of miliary tubercular disease of particular organs may indeed consist of nothing else than the dead, fatty, and calcified young of worms."

45. 5th. In the third or fourth week, when the young brood of *Cysticercus pisiformis* measures about 2 millim., and that of the *Cænurus* is of the size of a pin's head, we may see, according to LEUCKART, beneath the epidermis a layer of muscular fibres. Then follows a fatty structure, and then the medullary substance. At the point where the head is to be formed, a *turbidity* is produced by the aggregation of small nucleated cells, in the interstice between the muscular and medullary layers. This is the first foundation of the head of the tape worm. Opposite to this turbidity a pit is observed externally, the inner wall of which is formed by the inverted epidermis, and which passes through nearly the whole depth of the globular foundation of the head; this latter appearing like a peg attached to the inner wall of the worm. In the central mass of the head, especially in its upper half, calcareous deposits appear, at first sparingly. Two or four vessels are also observed rising in a tortuous form through the upper part of the lobe, and passing over on the external sac-like envelopes. The vesicle now becomes larger and clearer, and the medullary layer, pushed against its peripheric layers, grows thicker, whilst vessels and calcareous corpuscles make their appearance, especially in the anterior part of the body, between the muscular and epidermic layers, but not in the former, in some cases before, in others after, the formation of the cephalic process. From the time when this process commences, the caudal vesicle ceases its activity in the true *Cysticerci*; its functions are then only passive, serving as a reservoir of nutriment, or as a protection to the head, which requires repose for its further development, and preserving sufficient room for this end. I cannot follow the descriptions of KÜCHENMEISTER and other helminthologists further, as respects the development of the head and its hooklets, &c., but must refer the reader to Dr. LANKESTER's translation of the work of the former, and to the other works referred to in the Bibliography. I may, however, notice the following conclusions of this observer:—

46. 6th. In the progress of the metamorphosis of the six-hooked cestoid brood into scolices, it has been shown that a portion of the *Tæniæ* pass through a true *cysticercal* (bladder-worm) state, whilst the other part, without ever arriving at this state, furnish exactly the same structure (cestoid heads—scolices). This latter part KÜCHENMEISTER has divided into *platycercal* and *acercal* forms. (*a.*) True *Cysticerci* occur only in warm-blooded animals, especially mammalia; and cysticercoid forms principally in cold-blooded animals. (*b.*) The eggs of all *Tæniæ* which pass a cysticercal stage are distinguished by the small size of the embryo, and its six hooks, and by their brown hard shell beset with asperities. The eggs of the *Tæniæ* with only a cysticercoid phase of development have softer, colourless, transparent shells, are much larger, and contain a much larger embryo, furnished with larger hooks. (*c.*) *Tæniæ* with a cysticercal phase of development, are inferior to the platycercal and acercal forms in regard to the length and cylindrical form of the rostellum. (*d.*) *Tæniæ* with a cysticercal stage possess during this a highly developed *receptaculum capitis*, which forms a part of the future neck, in which, as long as this stage lasts, the head is introverted. The allied platycercal and acercal forms are destitute of the accumulation of fluid, and of the *receptaculum*. (*e.*) If the six-hook cestoid brood gets into animals which are not suitable to it, or into such organs in an animal otherwise suitable, it is destroyed in a very short time, even in the few first days of its immigration; the form of miliary tubercular disease of the organ may thus have frequently occurred. This may be demonstrated by administering mature proglottides to various animals. (*f.*) A great

number of the cestoid embryos which become developed to the scolex state die, and are destroyed either by a natural or a pathological death. We only know that their life may extend even to several years; but inflammatory processes and alterations of the secretions extending to them from the organs they inhabit, may destroy them more or less rapidly, and change them into masses consisting of cholesterine, calcareous, fatty, suety, and similar substances.

47. iv. *The Scolex passing into activity.*— On this topic I must refer chiefly to recent writers, more especially to Küchenmeister, and notice merely a few of the more prominent parts of their descriptions. As a general proposition, it is inferred *"that the animal infested by cystic worms is usually the source of food, or the prey, of that infested by tape worms."* The host of the cystic worm is devoured by a carnivorous predaceous animal, and by this means the cystic worm arrives, together with his previous host, in the stomach of the carnivorous animal. During the process of digestion, the enveloping cysts in which the cystic worms were enclosed, or, if the animal lived free in cavities, these latter, perhaps both, are digested, or opened previously by the teeth of their devourer, when the cystic worm escapes into the cavity of the stomach. Here the worm extends itself; its caudal vesicle collapses. On the caudal vesicle and the middle of the body of the cystic worm digestion begins to act perceptibly. The body at the same time elongates and extends itself, but the head and the short neck are still inverted, as during the cysticercal state. But now the head and neck extend themselves. The head, the hooks still exhibiting the position of cysticercal existence, their apices being directed backwards towards the suckers, and their shafts towards the apex of the head, draws itself, as it were, outwards through the neck, by turning itself inside out. As a matter of course, the whole worm is thus turned inside out; and the margins of the head and neck which were previously turned in, become the free outer sides of the worm. A portion of the *receptaculum capitis* is then cast off, with the body and the caudal vesicle, and a portion wraps itself into the funnel-shaped constriction of the young *Tænia.*

48. At various times, sooner or later, according to the evolution and age of the cystic worm, the formation of segments commences and with this, consequently, this stage of development is concluded. It should be recollected that *Tæniæ* cannot be reared from such scolices as do not exhibit perfectly developed hooks. They die immediately. The first transformation of all cystic worms introduced into the intestines of a warm-blooded animal takes place in the same way; but the process stops before the commencement of segmentation, in those cases in which the intestine of the animal in which the vesicular worm has arrived is unfavourable for it and its future development. Thus circumstanced, it lasts but for a short time, no trace of it remaining a fortnight after. The transformation of the platycercal forms into mature Cestoidea takes place exactly like that of the cysticercal forms: in the acercal forms no casting off of a portion of the former embryonal vesicle takes place, but the whole of it is retained, and the formation of segments commences immediately upon it. It still remains to consider—*How the scolex, after entering upon its activity, becomes converted into a tape-worm colony—Strobila.*

49. v. *The Strobila, or the so-called tape-worm colony.*—"Immediately after the healing of the cicatrix on the neck and on the former *receptaculum capitis*, there commences between the posterior end of the head and this cicatrix a budding forth of the body, produced without sexual propagation, and which becomes constricted into segments by transverse furrows or wrinkles. By the constant production of new masses on this place, that previously formed is continually pushed further back, so that this cicatrix is at last removed to a considerable distance (varying according to the species) from the head. During this time the individual segments increase, and grow in the same ratio as their removal from the head: they at the same time acquire sexual organs, male and female, in each segment, and which are very rarely, and probably never wanting in the colony. Finally, when they have attained a sufficient size and maturity, they produce the embryos (§§ 41,2.), and last of all cast themselves free in the form of the proglottides (§ 36.). If we were to give a definition of the strobila—it is a series of joints, or individuals, which are formed from the active scolex in the space between the part of the latter that must be called the head proper, and its cicatrised extremity, by a sexual reproduction; which are in direct union with the scolex, and which, when examined from the anterior to the posterior, present *asexual* segments, half and fully formed *sexual* segments, and segments engaged in sexual retrogression, the last of which have become truly independent individuals." (Küchenmeister, *Op. cit.* pp. 84-5.) Thus we have seen how the segments with their ova and embryonic structures, are developed; and, when they have become the hindmost of the colony, cast themselves loose.

50. My limits admit not of a full *description of the minute structure* of the fully developed *Tænia.* It will be found in the work just quoted. I may, however, briefly state that no digestive apparatus has been found in these animals. Most writers assert that up to this time no *nerves* have been detected in them; but Huxley states that a single *ganglion* is situated in the axis of the head, and that it sends off nerves to the suckers in some *Tæniæ.* The most important points are the dissemination of *calcareous corpuscles* in their structure, and the formation of *circulating vessels.* With the development of the scolex it was seen that a union of four principal lateral vessels takes place in the head, and that smaller branches are given off from these trunks. These vessels probably open outwards near the *receptaculum capitis* or neck, or about the situation of segmental production; but the ultimate structure, connection, and termination of these vessels have not been precisely determined. The *muscles* consist of transverse and longitudinal fibres, which may be recognised most readily in the neck. The *suckers*, peculiarly muscular parts, present radiate fibres uniting in the middle of the sucker, under which lies a layer of circular fibres, and the *rostellum* It has not been ascertained whether or no muscular fibres run to the hooklets of the embryo. The *hooks* of the *Tæniæ* appear to ride upon the skin or integument, or in slight impressions. The movements of the hooks seem to be produced by changes in parts of the head, particularly of the rostellum. The *sexual organs*,

both male and female, exist in each segment, in which numerous eggs are produced. A very minute description of these organs, — the penis, testes, vagina, uterus, &c. — is given by KÜCHENMEISTER.*

51. THE CESTOIDEA, or Cestode worms, occur in man either in the mature state, and then in the intestines only (*Bothriocephalus latus, Tænia mediocanellata, Tænia nana*); or in the larva or scolex state (*Cysticercus visceralis* seu *tenuicollis, Echinococcus veterinorum,* seu *scolicipariens,* and *E. hominis* seu *altriciparians*); or lastly, in all known stages of development (*Tænia solium* and *Cysticercus cellulosæ*).

52. Genus 1. BOTHRIOCEPHALUS = DIBOTHRIUM.—This division is abundantly represented in predaceous fishes, more sparingly in piscivorous birds, especially the marine *Raptores,* and rarely in a few mammalia. Of the Terrestrial mammalia inhabiting inland places, man only harbours *Bothriocephali.* KÜCHENMEISTER defines this *genus,*† and the *species* here to be considered, as subjoined*, and gives the following as the *synonymes* of the species, *Bothriocephalus latus* or *Dibothrium latum; Tænia lata, T. grisea, T. vulgaris, T. membranacea, T. dentata, T. inermis; Ténie à anneaux courts, T. large, T. à épine; Lindwurm, Baandwurm, Baendelorm:* the tape worm, jointed worm, the short-jointed worm.

53. i. GENERAL DESCRIPTION.—*The colour of the living worm* is bluish white. Specimens preserved in spirits change greatly in colour. The *active scolex,* or head, is obtusely conical. The two lateral pits (analogues of the sucking discs of *Tæniæ*) are fissuriform, and appear, like the sucking discs on the feet of flies, rather to effect adhesion than to draw nourishment, which is probably introduced through the entire skin. The *neck* is more distinct in young than in old specimens, the transverse wrinkling, *i.e.* segmentation, commencing immediately behind the head. The *strobila,* or jointed body, presents a ventral surface, on which the sexual apparatus opens, the opposite being the dorsal surface. Each segment has four margins —two free lateral margins, slightly undulated, and an anterior and posterior margin, articulated with the upper and lower segments in the colony. The form varies according to the preponderating contraction of the longitudinal or transverse fibres, the breadth, however, being much greater than the length—as three to one. In the central line the segments are thicker (up to 1‴) and darker; the lateral margins flatter and whiter. The *vascular system* consists of lateral longitudinal cords, which contain a limpid fluid. A respiratory system and organs of sense are wanting. The *sexual organs* generally are single in each segment, but they are sometimes double.

54. *A. The ova and embryos.*—The former exhibit an external hard brittle shell, which often breaks so as to represent operculated ova, like those of the *Trematoda.* From the opercular opening a limpid vesicle emerges, in which, however, KÜCHENMEISTER did not find the six hooklets which VON SIEBOLD considers similar to those in the circlets of the *Tæniæ.* Possibly a part of the eggs of the *Bothriocephali* are not produced with undeveloped embryos, so that the latter are perfectly formed only when free in nature, as the eggs of the *Ascarides.* The *resting scolex* exists in the fishes, especially marine fishes. In these certain cestode worms live, having a band-like, inarticulate appendage, but exhibiting no commencement of sexual development. These become converted into mature *Bothriocephali* in the intestines of higher fishes, or of the marine birds of prey.

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* The developmental history of the *Cestoidea* may be understood, if considered as follows: —

"i. *The mature sexual animal,* which is produced by asexual gemmation, separates from the colony as soon as it has attained its majority, migrates actively from the intestinal canal of its host into free nature, and thence passively into the stomach of another usually herbivorous animal. It bears within it —

"ii. The *grand-nurses* or *embryos* produced by sexual, and perhaps by asexual, reproduction, furnished with four or six hooks, which are destined to enter passively into the stomach of a herbivore, and thence to migrate through the body of the latter, either actively, or by the intervention of the vessels, active — passive — actively. (The asexual propagation of the brood in the *Cestoidea* is rendered improbable even by the fact that, in the whole developmental series of these *Cestoidea,* a sexually mature animal has never been met with.)

"iii. The *resting scolex* (nurse), produced by asexual gemmation in and by the large six-hooked embryo, still concealed within this embryonal vesicle, or lying beside it enclosed in peculiar cysts, or in closed serous cavities. In its non-gemmiparous part the embryonal vesicle acquires, according to the species of cestoid worm, and according to the different hosts (cold or warm-blooded), sometimes the form of a globular vesicle, sometimes that of a flat band-like strip, and sometimes is only just sufficient to cover the scolex, lying quite close upon it, when it really forms nothing but a *receptaculum capitis.* Thus we obtain three forms allied to each other in their degree of development: the *cysticercal* forms (*Vermes cystici,* including *Cœnuri* and *Echinococci*); the *platycercal* (similar to Stein's cestoid worm of *Tenebrio molitor,* and Von Siebold's from *Arion empiricorum*); and the *acercal* (certain embryos of *Tetrarhynchi*). Every one of these is a normal form; even the cysticercal forms are neither morbidly degenerate, nor become dropsical, nor strayed.

"iv. The resting scolex, transferred into the intestine of an animal, becomes converted into the *scolex passing into activity.* The latter is distinguished from the resting scolex by the extension of the entire body, by the altered position of the adherent apparatus (suckers and hooks), by the attachment in the intestinal canal, and in the cystercal and platycercal forms, by the casting off of the barren portion of the embryonal vesicle, and the formation of a cicatrix on this spot. In the acercal forms nothing is cast off, nor is there a cicatrix formation.

"v. The *strobila*=equal the tape-worm colony, budding immediately from the scolex, which has become active by asexual propagation (gemmation), is more or less distinctly jointed, and becomes sexually mature posteriorly. Its last segments, which are cast off, and lead an independent existence, are called *proglottides* (i.), and bear within them the embryos produced by sexual reproduction (ii.)." (KÜCHENMEISTER, *Transl. by* Dr. LANKESTER, pp. 93, 94.)

† "*Cestoidea,* 2 *osculis suctoriis, aut* 2 *foveis marginalibus, oblongis aut longitudinalibus oppositis instructa. Capite subtetragono, depresso, articulato plerumque, inermi. Pori genitales omnium articulorum in linea mediana animalis et in ejus superficie abdominali siti.* Scolices *extra tubum intestinalem in cystidibus peculiaribus ad vermium platycercorum modum, aut in tubo intestinali animalium minorum aquaticorum statu immaturo viventes;* Strobilæ *in tubo intestinali animalium aquaticorum rapacium, avium maritimarum et mammalium viventes;* Proglottides *veræ interdum absunt, interdum adsunt, sæpissime in longa articulorum serie conjunctæ dehiscentes.* Embryones *sex hamulis armati; ovulorum testæ sæpissime coloratæ.*

* "1. BOTHRIOCEPHALUS LATUS = DIBOTHRIUM LATUM. —*Caput oblongum, inerme,* 2 *bothriis-foveis marginalibus, formam rimæ aut fissuræ* (*fente*) *adoptantibus; collum subnullum; articuli numero circa* 2000, *maturi omnino latiores* (*ad* 27 *millim.*), *quam longi, socialiter decedentes; pori genitales in linea mediana siti, masculus major et superior, ex quo penis lævis et brevis prominet, femineus minor, posterior inferiorque.* Scolex *quiescens ignotus;* scolex *activus cum strobila in hominis tubum intestinalem incolens, longitudinem* 7-8 *ulnarum, secundum Dujardinum ad* 20 '*metres*' (?) *exhibet.*

"Embryones 6 *uncinulis* (?) *armati, in ovulis* 0·028—32 *mill. longis et* 0·002 *mill. latis, ellipticis, flavo-fuscis, operculo dehiscentibus inclusi.*"—KÜCHENMEISTER.

Whether the cestode worms are developed in the intestines of fishes in which they are found, or are conveyed there in one or other of the animals on which these fishes feed, in which they had been converted into scolices, after the animal had swallowed the eggs of the mature *Bothriocephali*, is still undecided. Probably the ova and scolices are developed as already described (§§ 37—47.). As the host of the *Cysticercus* is devoured by an animal, in the intestine of which the scolex, being set free, immediately developes itself.

55. *B.* We have no data as to the production of the *Bothriocephalus latus* in man. This worm has been found in the cat, but is extremely rare in all terrestrial animals. The cat has evidently obtained it from the intestines of fishes, which in sea-ports, and on the sea-coasts, are left in large quantities, and are used as manures. It is difficult, notwithstanding, to account for the presence of this animal in man. The ova from the proglottides of this worm may, however, be introduced into the human intestines by means of vegetables, where the intestines of fish have been used as manures, or where they have been conveyed in sewage water. The passive migration of the embryo into the intestine of another animal, and its conversion in this intestine into an asexual band-like scolex, is much more probable than the development of all the grades in the same intestine, on account of the dissimilarity existing between the embryo and its parent.

56. *C. The Physiological relations of Bothriocephalus* are chiefly its weaker vital manifestations, and the smaller number and less perfect development of its sucking organs, than those of the *Tæniæ*, which explain its easier expulsion from the intestines. The power of imbibing fluids by the bodies of the *Bothriocephali*, and all *Cestoidea*, has been proved by ESCHRICHT and others. Transudation takes place in small, pellucid, oleaginous drops (sarcode). Whilst the *Nematoda* and *Echinorhynchi* swell up by imbibition, the *Cestoidea*, owing to an abundant exudation, experience only a slight swelling from imbibition. Whole series of segments of the *Bothriocephali* pass off spontaneously, but never single segments, as in the *Tæniæ*. The duration of the life of the former is not known. More than one or two worms of this genus are rarely found in the same intestine, and their length seldom exceeds twenty feet.

57. Genus 2. TÆNIA.[*]—i. TÆNIA SOLIUM, *and its Scolex-nurse = Cysticercus cellulosæ.*

SYNONYMES.—*Ταινίαι*, Aristotle; *πλατεῖα ἕλμινς*, Hippocrates; *Lumbricus latus*, Pliny; *Tænia solium*, Linnæus et Auct. permulti; *T. cucurbitina*, Pallas, Goeze, &c.; *T. vulgaris*, Werner; *T. dentata*, Gmelin, Nicolai; *T. osculis marginalibus solitariis*, Bradley; *T. armata humana*, Brera; *T. lata*, Reinlein; *T. fenestrata*, Delle Chiaje; *T. stigmatibus lateralibus*, Bonnet; *T. secunda*, Plater; *T. solitaria*, Leske; *T. articulos demittens*, Dionis; *Halysis solium*, Zeder; *Pentastoma coarctata*, Virey; *Vermis cucurbitinus*, Plater: Kürbiswurm, Kürbisformiger; bewaffnater Bandewurm; Kettenwurm, *Germ.*;—Ténie à longs anneaux; T. sans épines; T. de la seconde espèce; le solitaire; ver solitaire; T. bandelette, &c. The following names are also given it, in common with *Bothriocephalus latus* and *Tænia mediocanellata*: le ver plat, Bandelorm, tape worm, jointed worm.

58. *Tænia solium* presents *five steps* of development. 1st, *The sexual animal—Proglottis*; 2nd, The *grand-nurse—Six-hooked embryo.* 3rd, The *resting Scolex—Cysticercus cellulosæ*, in the parenchyma, areolar tissue, and cavities of the body; 4th, The *active Scolex-nurse*, that is the *Cysticercus cellulosæ*, which will become a *Tænia solium* in the intestines; and 5th, the *Strobila*, the series of segments of *Tænia solium* produced by gemmation from the fourth step.

59. *A.* THE MATURE TÆNIA.—The name *Tænia solium* is incorrectly applied to this worm, inasmuch as frequently two or three occur in the same person. Dr. PFAFF has seen seven expelled, KÜCHENMEISTER ten, HELLER thirty, and KLEEFELD counted forty expelled from one patient.

60. (*a.*) *The Strobila.*—The *head*, although varying somewhat in size, is seldom larger than the head of a common pin. It is of a blackish-brown colour, especially around the base of the short rostellum, and in the sacs around the base of the hooks, and in and around the sucking discs. The *hook-sacs*, as well as the hooks, are placed in

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[*] "Second Order (KÜCHENMEISTER), TÆNIÆ.—*Caput subglobosum aut tetragonum; acetabulis osculis suctoriis* 4, *rarissime* 6, *muscularibus, orbicularibus, symmetrice oppositis, valde contractilibus; rostello imperforato, retractili, in scolicibus quiescentibus inverso, in activis s. Tæniis maturis propulso, hamulorum simplici, duplici, aut multiplici corona armato; corpore plerumque albo, plano, depresso, bilaterale aut triquetro, articulato* (Strobila); *articulis maturis androgynis, aut non sexualibus* (?), *sponte et alio post alium dehiscentibus, Trematode cuidam similibus* (Proglottides); *systemate vasculoso perclaro; poris genitalibus lateralibus, plerumque alternantibus, masculo majore et anteriore, femineo minore et posteriore; genitalibus perfectis.* Scolices *quiescentes et immaturi formam cysti-, platy-, aut acercam ineuntes.* Scolices *activi cum strobila longitudine et latitudine valde variantes.* Embryones 6 *hamunculis armati, parvuli, pervivaces; ovula in illis qui formam cysticercam ineunt, minima, pileata, flavescentia, in ceteris majora, læviora et clariora.*"

I. TÆNIÆ WHICH OCCUR IN MAN IN THE MATURE STATE. 1. "Tænia solium, and its scolex nurse = *Cysticercus cellulosæ.*—Tænia matura = *Scolex activus cum strobila: longit.* 4—8 *metres* = 6—8 *ulnarum, latit. ad* 13 *millim.* Caput = *scolex sensu strictiore, breve, antrorsum planum,* 0·56—0·75—1·0 *mill. lat., acetabulis validis, prominentibus* 0·192 — 231‴ = 0·434—0·521 *mill. long., et* 0·182 — 224‴ = 0.410 — 0·505 *mill. lat.; rostello parvulo* 0·4 *mill. ad latera nigrescente; hamulorum* 22, 24, 28, 30, *plerumque* 26, *duplice ordine, longit.* 0·167 *quoad majores,* 0·11 *mill., quoad minores hamulos* (*secund.* Leuckart), 0·18 *et* 0·12 *secund. meas mensuras, ungue et stylo hamulorum ex longit. fere similibus, formâ hamulorum omnino vastâ; loculis hamulorum perclaris, nigrescentibus; collo perparvo, fere nullo; corpore antrorsum maxime attenuato, deorsum ad* 10—14 *mill. lato, articulato, poris genitalibus alternantibus, interdum irregulariter; utero ramis* 6—10—13, *irregulariter alternantibus, denso ramificatis instructo; corporibus calcareis in capite rarioribus* (0·004‴ = 0·009 *mill. long. et lat.*), *in corpore crebrioribus et majoribus* (0·005‴ = 0·012 *mill.*) Proglottides *ad* 16 *mill. longæ et ad* 6 *latæ, ad inferiorem partem crassiores, margine magis toroso et angulis magis prominentibus, quam ad superiorem partem, ut in aliis Tæniis, ovulis* 0·016‴ = 0·036 *mill. long.,* 0·016‴ — 19‴ = 0·036 *mill. lat.; testâ ovulorum crassiore* (0·0063 *mill.*). Embryonibus 6 *hamulis ornatis.* 0·028 — 0·032 *mill. long. et lat., migratione indigentibus.*

"Habitat.—*Solitarie aut sodaliter* (*ad* 40 *usque*) *in tubo intestinali hominis, inque terris diversissimis; vix in Cane domestico.*

"Scolex *quiescens* = *Cysticercus cellulosæ, vesicâ caudali haud magnâ* (*ubi plurimum* 15 *mill. in diametro*) *transverse ellipticâ; corpore inverso, transverse rugato,* 8 — 10 *mill. longo. In tubum intestinalem translatus intra* 3 *menses maturescit. Habitat in telâ cellulosâ totius corporis et nonnullis corporis cavitatibus clausis* (*oculis, cerebro, &c.*) *imprimis in homine, Sue scrofâ domesticâ, rarius ferâ, Simiâ, Cervo, Capreolo, Cane domestico* (*Arachnoid. et muscul.*) *valde dubiosus in peritoneo Canis domestici et Muris Ratti. Per injuriam a nonnullis* Cœnurus cerebralis hominis *nominatus.*"—KÜCHENMEISTER.

a double circular series. The one series does not materially differ from the other. As in all the *Tæniæ*, the points and spines of all the hooks fall in the same circle, or in two circles lying close together, the number and position of the hooks corresponding with the sacs, and varying from 22 to 28. The *sucking discs* are nearly circular, or somewhat oval, and surrounded by a circular collateral branch of the longitudinal canals, by which a sort of vascular net is formed. Close behind the sucking discs, and near the head, the *vessels* collect in four main branches, which are united quite at the front of the head by a common transverse branch, thicker than they. In the vessels of various *Cestoidea*, Virchow, Wagener, and others, have seen a sort of ciliary epithelium projecting into them, and moving in the fluid. The *calcareous corpuscles* reach about to the middle of the sucking discs. They are few and small on the head. The *slender neck*, of about 6‴ in length, exhibits no traces of transverse striæ or segmentation. The calcareous corpuscles are somewhat more abundant, and also larger than in the head. Behind the neck commences the true jointed body of the *Tænia*, in which Küchenmeister counted 825 segments in one specimen ten feet two inches in length. The proportionate size of the segments gradually increases posteriorly, or as they depart from the head—in length from $\frac{1}{12}$‴ to 7‴. In this species, as in all *Cestoidea*, contact with water causes the emission of Dujardin's sarcode, in oleaginous drops. The *sexual organs* appear from about the 280th to the 300th segment, and onwards, from the head, in the median line of the *Cestoidea*, at first as a simple brownish-yellow canal, with short lateral off-shoots, towards which two transverse slightly coloured lines (seminal cord and vagina) run from the sides. The alternating *pori genitales* first appear about the 317th segment, and become distinct in the 350th. The sexual organs are more and more developed from the 350th to the 600th segment, where ova commence, which become mature from the 650th to the 700th segments. Both male and female organs generally exist in the same segment, and are minutely described by Küchenmeister. Each *joint when divided* presents, 1st, *Epidermis* of a chitinous structure, without calcareous corpuscles; 2nd, *Longitudinal fibres*, with calcareous corpuscles; 3rd, *Transverse fibres*, with few calcareous corpuscles; 4th, Sexual organs.

61. *B.* Scolex of Tænia solium.—*Cysticercus cellulosæ*. The former is identical with the latter, as proved by the identity of the head in both; by the general and particular circumstances under which *T. solium* occurs, and by converting, by experiments in feeding, *Cysticercus cellulosæ* into *Tænia solium*, and the eggs of the latter into *Cysticercus cellulosæ*.

62. (*a.*) *The ordinary habitation of the Cysticercus cellulosæ* is the flesh of the pig; and *Tænia solium* is almost entirely unknown where the use of this flesh is avoided, as amongst the Jews and Mohammedans, who strictly adhere to their religious precepts. On the other hand, *Tænia solium* is abundant wherever the breeding of pigs occurs, as in Poland, Hungary, Pomerania, Thuringia, England, &c., "and especially among those engaged in trades which bring them in contact with raw pork, and therefore with raw *Cysticerci*, as butchers, cooks, sausage-makers." Küchenmeister found *Cysticerci* in the water used in washing sausages. The direct proof of the identity of this cystic worm and *Tænia solium* is shown by the following *experiment upon a murderer condemned to death.* Exactly 72, 60, 36, 24, and 12 hours before his execution, 12, 18, 15, 12, and 18 specimens of *Cysticercus cellulosæ* were administered to him partly in rice or vermicelli soup of a blood heat, and partly in blood-puddings. The *Cysticerci* had already lain seventy-two hours in a cellar before Küchenmeister discovered them. The last administered had consequently lain about 130 hours out of the living organism, and he hardly believes that those *Cysticerci* which had lain more than eighty hours were still capable of development, any more than he can believe this to be the case with the *Cysticerci* contained in smoked sausages and hams. On dissection forty-eight hours after execution, he found ten young *Tæniæ*, of which six were deprived of their hooks, but four distinctly showed the hooks of *T. solium*. The little *Tæniæ* were 4—8 millim. in length, and had attached themselves by their hooks and proboscis to the intestine, and possessed a small band-like appendage, 2—5 millim. long. The preceding experiment is proof of the conversion of the cystic worms into *Tæniæ* in the human intestine, and also of the mode of infection. Küchenmeister is convinced that the scolex of a *Tænia* retains its power of development in its dead host only as long as no putridity occurs.

63. (*b.*) The further proof of the identity of *T. solium* and *Cysticercus cellulosæ* is derived from the structure of the head of the latter. "This cystic worm, like all others, forms a vesicle the size of a pea or very small bean, with a little white head in its interior, from which the true scolex may be evolved by pressure. This scolex bears a head with four, and sometimes six, sucking discs (the latter especially in the human brain), round which the vascular system runs, and collects into two longitudinal canals on each side. The short rostellum bears from twenty-two to twenty-eight hooks, placed in a double crown. Besides these, the head exhibits a sparing brownish-yellow, or blackish-brown pigment," and five sacs round the stems of the hooks. The neck is very short, poor in calcareous corpuscles, opaque, and colourless; the body is wrinkled, abounds with calcareous corpuscles, and the head is inverted into it as long as the caudal vesicle is alive and uninjured. After the death of the worm the head becomes everted. (See also § 46. *et seq.*)

64. (*c.*) *Proofs of the conversion of the six-hooked embryos enclosed in the eggs of Tænia solium into Cysticercus cellulosæ.*—Küchenmeister, in 1851, expressed the opinion that the pig infects itself with *Cysticercus cellulosæ* when it meets with the eggs and proglottides of *Tænia solium* upon the pastures; and in 1853 Van Beneden administered *T. solium* to two pigs, and thereby rendered one pig measly. The following year Küchenmeister fed three sucking-pigs, on the 7th, 24th, and 26th of June and 2d of July, with segments of tape worms, partly given off spontaneously and partly artificially expelled. On the 13th of July they were again fed with artificially expelled segments. "One of the pigs was killed on the 26th of July, and exhibited young *Cysticerci* corresponding with the days of administration, of which the largest individuals formed vesicles of the size of a hemp-seed, with a central turbidity, i.e. the

commencement of a head. The second pig was killed on the 9th of August, when thousands of *Cysticerci* were found in all parts of the body; the largest individuals were as large as peas, and exhibited a distinct head, whilst the smallest were only of the size of a hemp-seed. The third pig, which was killed on the 23rd of August, was uniformly set, throughout all parts of the body, with *Cysticerci* of various degrees of growth and development. The largest were almost perfectly developed; others resembled those last described. He undertook the examination of a weighed piece of the flesh, and found 133 *Cysticerci cellulosæ* in 4½ drachms of it. If we calculate from this quantity the number of *Cysticerci* which would have existed in 1 stone, or one-fifth cwt. of the pork, we obtain the great number of 88,000 individuals in this weight. A fourth pig of the same litter, to whom no *Tæniæ* had been administered, exhibited no traces of *Cysticerci* on dissection." (KÜCHENMEISTER, *Op. cit.* 121, 21.)

65. LEUCKART repeated and confirmed the above experiment, and recognised, in the mode in which *Cysticercus cellulosæ* is developed from the embryo of *T. solium*, exactly the same type as that above described as the type of the formation of the so-called *Cysticerci* in general. It may, however, be noted, that this worm acquires the vesicular form, and becomes covered with a vascular net, rather early, and at a time when no trace of the head can be observed. The first appearance of the head commences in *Cyst. cellulosæ* soon after the seventh week, at which time the embryo is about 2·5 millim. in diameter.

66. (*d.*) *The Scolex of Tænia solium, Cysticercus cellulosæ*, has hitherto been found in the most various muscles; in the *muscles* of the heart, in the *cellular tissue*, in the *brain*, and in the *eye* of man. In these it acquires various forms and sizes, according to the space afforded for its development. In the ventricles of the brain and eye, its caudal vesicle attains even the size of a walnut, and remarkable forms. The size and form of the *Cysticercus* are determined chiefly by excess of nourishment, and by softness, looseness, and other properties of the tissues in which it occurs. The form is not material, the nature of the worm is the same.

67. (*e.*) The *symptoms* it produces differ with its seat or position. It is almost harmless in the *subcutaneous cellular tissue*. In *muscles* it often occasions but little inconvenience. In the *muscles of the heart*, however, it may cause softening and other organic lesions. But its situation in the deeper muscles, even in the muscles of the heart, admits not of diagnosis. The situation of this *Cysticercus* in the *eye* is very important.—*a.* It has been found *between the conjunctiva* and the *sclerotica*, where it is of least serious occurrence, as it may easily be removed by operation, as in cases recorded by HÖRING, ESTLIN, BAUM, and others. —*b.* In the *anterior chamber*. It was first seen in the living subject by SÖMMERING and SCHOTT; and in the *posterior chamber* by VON GRAEFE. —*c.* In the *vitreous humour* by the last-named writer and others.—*d.* In the *retina* and under the *retina*, in very rare cases. In these latter situations this cystic worm has been detected during life chiefly by means of the ocular speculum of HELMHOLTZ. In most of these cases, partial or complete loss of sight by the affected eye, squinting, movements of the worm, inflammation of the structures, followed by partial disorganisation, and a greenish tint of the vitreous humour, were the symptoms chiefly observed. In rare instances only were tape worms present, or *Cysticercus* present in other parts of the body. —*e.* *Cysticercus cellulosæ in the human brain* seldom occurs, and as seldom can be recognised during life, unless, conjoined with cerebral symptoms, vertigo, &c.—*f.* *Cysticerci* are observed in other parts of the body, or *Tænia solium* has existed at an earlier period of the life of the patient.

68. ii. TÆNIA MEDIOCANELLATA* (KÜCHENMEISTER).—DESCRIPTION. (*a.*) The epidermis of the animal is distinct, soft, consisting of delicate decussating lines, without calcareous corpuscles. Underneath are longitudinal fibres, running through the whole body of the animal; these, as well as the next layer of transverse fibres, contain the calcareous corpuscles embedded in them. The size of the sucking discs, which are quite black, gives the head of this *Tænia* a considerable bulk. Transverse vessels run through the space between the sucking discs, and from these a branch runs to and around the discs, until the four longitudinal vessels are developed from them in the neck; these vessels becoming thicker as the segments increase in size. The segments, which have a great tendency to increase in breadth, are at first 1 millim. in length, and about three in breadth. Afterwards, also, the breadth predominates over the length for a considerable space. But this proportion does not continue downwards, and segments of 1—1½ in. of length and only 3—4 lines in breadth are met with. That the last segments or proglottides have a tendency to pass away without fæces is beyond a doubt; but this also takes place with *T. solium*, although more rarely. The segments usually pass when the patient is standing, and passing along the thighs, occasion a moist and cool sensation, and are found creeping over the surface.

69. (*b.*) This *Tænia*, when artificially expelled, breaks off close to the neck. After the lapse of about ten weeks from this expulsion, a fresh passage of proglottides takes place. From the spontaneous passage of these without fæces it may be inferred that the reproduction and growth of the segments are extremely rapid, and that the animal must be more injurious to its host than *T. solium*.

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* "Tænia matura.—*Species longissima* (*ad* 12—14 *ulnas longa*), *latissima, crassissima.* Capite *inermi, permagno, ad* 2 *millim. lat., valde nigrescente; acetabulis* 4 *permagnis* (*ad* 0·367''' = 0·829 *millim. long. et* 0·259''' = 0·711 *millim. usque lat.*).

"Systemate vasculoso: *in capite simpliciore, quam in* T. solium; Corpore calcar.: *ad* 0·012 *millim. in capite, ad* 0·018 *millim. in articulis magnis, magisque numerosis, quam in* T. solium. Rostellum *nullum.* Collum *perbreve, sed distinctius, quam in* T. solium. Articuli *posteriores latissimi, ad* 17 *millim. lat. et ad* 9—14 *millim. long. crassi;* poris genitalibus *irregulariter alternantibus.* Proglottides *permagnæ et pervicaces, sæpissime sponte et sine fæcibus humanis ex ano demissæ, ægrotumque valde perturbantes; in maxima sua extensione* 25—30 *millim. long. et ad* 7 *millim. lat.*

"Uterus *permultos ramos* (*ex utroque latere usque ad* 30) *in margine libero clavæformes, non amplius dendritice, ad summum bifurcatim divisos, inter se parallelos.* Ovula *magis ovalia, læviora, et clariora, quam in* T. solium, *ad* 0·036 *millim. longa et* 0·028—33 *lata.* Testâ *crassa uti in* T. solium. Embryones 0·028—32 *millim. longi,* 0·023—26 *lati.*

"Scolex *quiescens ignotus. Fortasse in sue aut bove, fortasse in animal. inferior. ordinum.*"—KÜCHENMEISTER.

Küchenmeister mentions a case in which the number of proglottides, which passed almost daily, amounted, in the aggregate, to upwards of 100 feet in 80 days; and that in the course of this time 1¼ foot of tape worm was passed and regenerated each day. The internal irritation of the rectum and anus, produced by these segments when forcing their passage, and the unpleasant clamminess they occasion, especially by the deposition of their eggs, which often also occurs at this time, and which appear like to a white moist sand, are very distressing to the patient. In the case just referred to, from 5—15 proglottides passed daily from the patient with the fæces; and as these immediately laid their eggs, the fæces looked as if sprinkled with white sand.

70. (*c.*) The *Scolex* is unknown. In Dresden it cannot be rare, as this *Tænia* is not uncommon there. It is not improbable that the cystic worm belonging to this species may occasionally occur amongst the specimens pronounced to be *Cysticercus cellulosæ.* This point might have been determined by feeding pigs with the eggs of this *Tænia*. An intelligent patient, from whom Küchenmeister expelled this *Tænia* by means of his preparation of the extract of pomegranate root, states that he had observed his tænia soon after dining frequently, at an eating house, on raw beef steaks and green salad and radishes. The scolex was either seated in the beef, or in mollusca in the salad or on the radishes. "The *embryos* resemble in size and structure those of *T. solium*. Their migrations are unknown." Its *habitat* appears to be in Europe and Africa.

71. Variety[*] *from the Cape of Good Hope.*—A number of segments of this *Tænia* were expelled by pomegranate bark, and like *T. mediocanellata* were very difficult of expulsion. They were destitute of head and neck. Its total length must be at least 6—10 yards. Its segments are very thick, white, and fat; in the mature state more than one inch in length, and 3—5‴ in breadth, and extremely massive. They are distinguished by having a longitudinal ridge along the whole of the mature and immature segments. This *Tænia* is rich in cholesterine. Mr. Rose, who sent the segments to Küchenmeister, states that the migrations of the six-hooked embryos and the scolices are unknown, that it is impossible that the latter should live in the flesh of pigs, as the worm was obtained from a Hottentot, and the Hottentots, like the Jews and Mohammedans, eat no pork. A thick *Tænia* occurs in Abyssinia, among Mohammedan inhabitants. The Hottentots probably brought this tape worm with them from the Caffre wars, in which they enjoyed themselves amongst the cattle of the Caffres. The *scolex* probably lives in their cattle and sheep. May not the scolex have been a *Cysticercus tenuicollis*?

72. iii. Tænia nana[†] (Bilharz; Von Siebold).—This small filiform *Tænia* has broad and perfectly developed segments, and a large quadrangular head, at the angles of which the round sucking discs are placed upon globular elevations. The head is flat in front, and gradually diminishes in breadth, and passes into a long slender neck, which is followed by segments which become broader, until at last the hinder segments are three or four times the width of the head. These *Tæniæ* occupy only a limited space of the ilium. The *ova* are globular. The six hooklets of the embryo *Teniæ* are distinctly seen in the fresh ova. From the number of the *Tæniæ* found, and their very small size, Küchenmeister has believed this worm to be a *Tænia echinococcus.*

73. iv. Symptoms and Diagnosis of the mature Cestoidea occurring in the Human Intestine, of both Bothriocephali and Tæniæ.—Küchenmeister remarks that the stronger the patient is, the less the irritability of his system, the more regular his appetite and food, the fuller and richer his nourishment, the fresher his colour, the less he is inclined to diarrhœa, to anæmia, and chlorotic symptoms, the less does he complain of tape worm. According to most writers, chlorotic or anæmic symptoms are increased by the great appetite of the tape worm for proteinic substances, calcareous salts, and fat; and according to the degree of the symptoms are also the complaints of the patient. Seeger gives the following statement of the frequency of particular symptoms in 100 cases of tape worm:—In 68 instances nervous affections and general or partial convulsions occurred,—epilepsy, hysteria, abdominal spasms, convulsive cough, dyspnœa, melancholy, and hypochondriasis. In 49 cases nausea, with faintness and vomitings, was present; in 42, various pains in the abdomen; in 33, disordered digestion and irregular states of the evacuations; in 31, irregular appetite and voracity; in 19, habitual or periodical hemicrania; in 17, sudden colic; in 16, sensations of undulatory movements in the abdomen up to the chest; in 15, vertigo, delusions of the senses and defects of speech; and in 11, shifting pains in various parts. These *symptoms* are deceptive; many of them will be often experienced after the worm has been completely expelled; and even viewed in connection with the patient's habits, occupations, and residence in a locality in which the *Cestoidea* are known to be prevalent, are not of themselves diagnostic of the existence of tape worm. It is only by the discharge of segments of the worm, that the nature of the disease can be satisfactorily recognised. The passage of the segments *per anum*, either with the fæces, especially when there is diarrhœa, or without this accompaniment, is the most frequent. The discharge of them by the mouth is extremely rare, and can occur only when there is violent vomiting, and when there is dangerous obstruction of the bowels. The passage of them through the intestines into the peritoneal cavity, or into the urinary bladder, or through fistulæ opening on the surface of the body, can occur only when ulceration of the intestines has been followed by perforation and a fistulous com-

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[*] "*Nihil notum, nisi* Strobilæ *pars posterior. Articuli per totum corpus, cristâ longitudinali præditi, crassi, et longi. Pori genitales marginales alternantes.* Uterus et ovula *simillima illis* Tæniæ mediocanellatæ. *Verisimillimum est, strobilam mihi notam proliferatam esse a* Tæniæ mediocanellatæ *scolice quodam* 6 *osculis ornato.*" —Küchenmeister.

[†] "Corpus *filiforme, depressum;* Caput *antice obtusum, collum versus sensim attenuatum, acetabulis subglobosis, rostello pyriformi uncinulorum bifidorum corona armatum. Articuli transversi; cirri unilaterales, ovula globosa; testa lævi simplici* (?) *instructa* $\frac{1}{100}$'‴ *magna. Longitudo totalis* 6 – 10‴. *Patria Ægyptus, in hominis intestino tenui semel reperta numero permagno.*"—Küchenmeister.

munication in either of these directions, or after wounds penetrating into the bowels. These several ways by which segments of tape worm were passed externally were known to the older writers, and were ascribed by them to the mechanical or perforating action of the worm. But it is singular, that, whenever ulceration and perforation of the bowels occur coincidently with the presence of worms, an instinctive desire of the latter to escape from the bowel, through either the morbid opening or the natural passages, is observed.

74. v. Immature Tæniæ found in the Human Body externally to, but not within, the Intestines. — *These form the* Cystici and Acephalocystides *of older writers*. The Cysticercus cellulosæ, being identical with *Tænia solium*, has been noticed when treating of that tape worm (§ 62, *et seq.*). I shall only briefly notice the other Immature Tæniæ occasionally found in the human body externally to the intestines.

75. *A*. Cysticercus tenuicollis (Eschricht), Cysticercus visceralis (Auct.).—As the *mature Tænia*, of this cystic worm is not found in man, but chiefly in the dog and wolf (*Tænia marginata*), I shall not occupy any part of my limited space by describing it, but refer the reader to Dr. Lankester's translation of Küchenmeister's work (p. 178.).

76. (*a.*) The *Scolex or immature state*[*] of this *Tænia*, however, being sometimes formed in man, especially in former times, requires a brief notice at this place; it forms the *Cysticercus tenuicollis* of recent writers, and the *C. visceralis hominis* of earlier authors. The rarity of this scolex in human subjects in modern times has induced Virchow and Diesing to doubt its occurrence, whilst Eschricht has proved its rare appearance in man, especially in the liver.

77. (*b.*) The *structure of this Cystic worm* is rendered remarkable by its frequently enormous caudal vesicle, which in animals may attain the size of a child's head, by the concentric wrinkles or rings, visible externally, which pass round the worm, and which are crossed by very fine longitudinal striæ, so that, when it is laid upon a plate, and held on the same plane with the eye, the animal has a finely chequered appearance. In the dead *Cysticercus tenuicollis*, incrusted with calcareous matter, these concentric rings may be recognised, and the calcareous deposit often forms a plaster-like cast of the form and structure of the cystic worm. The parietes, also, when a transverse section of the dead *Cysticercus* is made, present a structure consisting of concentric strata, analogous to that of the *Echinococci*. Here, however, it is so extremely fine and delicate, that there is great trouble in detecting it.

78. *B*. Echinococci.— Some naturalists admit only of one species or variety of *Echinococcus*, others of two, and others of even a greater number. Von Siebold divides this species into *E. hominis* and *E. veterinorum*; but, from the accounts of various writers, both varieties have been found in the human subject.

79. 1st Var. Echinococcus scoliciparienss[*] — *Echinococcus veterinorum*, of authors.

Synon.:—*Tænia visceralis granulosa*, Göze; *T. granulosa*, Gmelin; *Vesicaria granulosa*, Schrank; *Hydatis erratica*, Blumenbach; *Polycephalus hominis*, Göze; *Pol. granulosus*, Zeder; *Pol. Echinococcus*, Zeder; *Echinococcus veterinorum*, Rudolphi; *Echin. giraffæ*, Gervais; *Echin. simiæ*, Rudolphi, aliique; *Echin. granulosus*, Rudolphi; *Echin. infusorius*, Leuckart; *Echin. polymorphus*, Diesing; *Echin. scoliciparienss*, Küchenmeister.

80. (*a.*) The *mature Tænia* has hitherto not been found in the human subject. Von Siebold in 1852, and Küchenmeister in 1854, bred this *Tænia* by giving *Echinococci* to dogs. The description in the subjoined definition gives all that is required to be known of it; but the *eggs* and *six-hooked embryos* must occur at some period in the human intestines, in the water and raw articles of diet, especially vegetables, fruits, roots, &c. Like the embryos of other *Tæniæ*, however, they escape the human eye. "Their migration is certainly performed, like that of the embryos of other *Tæniæ*, by their perforating the intestine and getting into the abdominal cavity, where they prefer attaching themselves to the liver or the kidneys, or to the organs in the thoracic cavity. A portion of them, however, may migrate along the *ductus choledochus* to the outer surface of the liver." They take up their position in the same way as the other *Cestoidea*, the envelopes formed around them being similar, but much thicker.

81. (*b.*) The *Scolex* forms a vesicle which, according to Eschricht, measures 2½—3 inches, and is firmly attached to the organ in which it dwells. The enveloping cyst is like others, but more concealed and more abundantly permeated by proteinous unorganised substances, by which its walls are thickened. It may be partly separated into layers, the inner being smooth, like a serous surface. A second vesicular body fits exactly to the inner surface of the innermost layer of this enveloping cyst, and is the true *cystic worm*, the so-called mother vesicle of the *Echinococci*, that is, the six-hooked embryo, which, continually increasing, has attained an extraordinary size. It is almost impossible to get the cystic worm uninjured out of its cyst, to which it ad-

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[*] "Scolex quiescens=Cysticercus tenuicollis.—Vesicâ caudali *tenui permagna* (1, 2, 4, 6" et ultra); Corpore 14—30 *millim. et ultra longo*, 5—10 *millim. lato, cylindrico*; Collo 8—15 millim. *longo*; Capite *uti in Tænia filis 2 gelatinosis, pone collo ex receptaculo capitis aut scolicis in vesicæ cavitatem emissis*. Metamorphosis *in Tæniam* 10—12 *hebdomadis post pastum peracta*.

Habitat. *Rarius in hominis abdomine (mesenterio et hepate), sæpius in Ruminantium, Equi, Suis Scrofæ Sciuri, Simiæ, &c., cavitate abdominali.*"—Küchenmeister.

[*] Tænia matura.—*Tænia minima, ad 3 millim. longo, corpore 3-aut 4-articulato*. Capite *subgloboso*, 0·3 *millim. lato*; rostello *parvulo, rotundato*, 0·125 *mill. longo*; osculis suctoriis *magnis* 0·13 *mill.*; hamulis *in duplice ordine positis* 28—36, *quorum majores ex Leuckartii mensura* 0·045, *minores* 0·088, *ex meis mensuris* 0·034 *et* 0·028 *habent*. Collo *longiusculo*. Articulis 3—4, *quorum ultimus toto corpore longior* (2 *mill. long.* 0·5 *mill. lat.*) *est*. Utero *medianâ loculis et stolonibus nec ramis propriis instructâ*; Ovulis *ovalibus*, 0·034 *long. et* 0·030 *lat., testa* 0·0019 *mill. crassa, cavitate interna* 0·027 *lat. et* 0·030 *long.*

Habitat. *In Canis domestici, imprimis in Canis lanii, fortasse etiam in Canis lupi, tubo intestinali.*

Scolex quiescens.=Echinococcus scoliciparienss. *Vesica minus pellucida, membranacea, in pariete ad* 1—2 *mill. crassa, ex pluribus* 0·005—0·01 *mill. crassis lamellis concentricis composita, parvulas gemmas* (brood-capsules) *stylosas gignens, in quibus scolices singuli proliferantur, magnitudinem* 30 *mill. et ultra exhibens. Scolices sociales gemmis disruptis libere in vesicam emissi, parvuli, capite Tæniæ modo dictæ*. Metamorphosis *in Tæniam post* 7—8 *hebdomades peracta*.

Habitat. *Interdum in homine, plerumque in aliis animalibus plerumque domesticis ex ordine ruminantium et herbivoracium.*"—Küchenmeister *in Op. cit.* p. 192, 3.

heres so firmly. The walls of this worm are elastic, and tremble like jelly, when touched, even after they are empty. They never collapse altogether as seen in *Cysticerci*, nor lie, like these, even when dead, at the bottom of the envelope-cyst. Their cut margins roll themselves up, and present a gaping appearance. The transverse section of this cystic worm shows a structure of more or less numerous consecutive circular strata, varying according to age.

82. *c.* The *structure* of this cestode has been described by ESCHRICHT, VON SIEBOLD, and others, who say that its parietes consist of two similar membranes, loosely connected, the outer being firm and cartilaginous, and the inner thin and smooth, resembling a mucous surface, which is beset with small elevations of a size up to ¼''', which are partly very young scolices, in the act of development, partly further developed scolices of $\frac{1}{10}$''', and partly the points on which such scolices formerly sat. In the fluid contained in these vesicles there are also free scolices, part of which are still furnished with the remains of the stalk. For other minutiæ of structure I must refer the reader to Dr. LANKESTER's translation of KÜCHENMEISTER's work.

83. This cestode worm is found chiefly in the *liver* of man and ruminating animals. It has been detected also between the choroid coat and the retina of the human subject. When present in the *liver*, this organ is generally swollen, especially posteriorly, pale, or of an uniform greyish-brown colour. Its surface presents larger or smaller spots of a whitish-yellow colour, of a regular form, and very slightly raised. This species is generally seated so deeply as hardly to project above the level of the surface of the organ, unless it is very largely developed.

84. *d.* The *symptoms* caused by this *Echinococcus* are usually slight, limited, and equivocal. The vesicles seldom exceed the size of a walnut or hen's egg. Even when they are present in numbers, their diagnosis is most difficult. When they are small or few, the disturbance of the functions of the liver may be slight. When more numerous or more fully developed, there are generally pain and uneasiness in the hepatic regions, with increased pain on pressure and percussion; the dull sound on percussion being more extensively heard, and the liver being often felt from one to two inches below the false ribs. There is also irregularity of the bowels, the evacuations being unhealthy, and often deficient in bile. Jaundice is sometimes observed. But all these symptoms may be caused by other lesions of the liver.

85. *B.* ECHINOCOCCUS ALTRICIPARIENS. *Echin. hominis*, Auctorum.

86. KÜCHENMEISTER* believes that this species has been confounded with the preceding.—*a. Its mature Tænia is unknown.* Nevertheless, he thinks that it probably occurs in the human intestines, and indeed in the intestines of those individuals who suffer, or have suffered, from the species of *Echinococcus* belonging to it in some part of their bodies, and in whom such a colony of *Echinococci* has opened towards the intestine. This *Tænia* may also develope itself in the intestines of domestic carnivorous animals. That the eggs and embryos must occur at some time or other in the human body must be admitted, although they escape observation from their small size.

87. *b. The Scolex—the Echinococcus altriciparians*—occurs not only in man, but also in the larger domestic animals, especially Herbivora. It is very prevalent in Iceland. Dr. SCHLEISSNER states that he saw fifty-seven human patients suffering from *Echinococcus* in that island; that it occurred more frequently inland than on the coast; and that it constituted one-eighth of the diseases of the place. Dr. THORSTENSOHN of that island says, that every seventh living human being in it suffers from *Echinococci*; that females are more liable to them than males, and that their abundance increases with age, men being most frequently attacked by them between their thirtieth and fortieth, and women between their fortieth and fiftieth years.

88. *c.* The *characteristics* of this species of *Echinococcus*, as distinguished from the preceding, appear to be as follows: — (*a.*) The enveloping cyst, and the mode of annexation of the inner wall of this cyst to the primary vesicle of the *Echinococcus* derived from the six-hooked embryo, are similar in this and the foregoing species; but the cyst formed by *Echin. altriciparians* is much larger than that of *Echin. scoliciparians*, and hence projects far above the level of the organ in which the colony exists.— (*b.*) Owing to its much greater bulk a proportionately increased interference with the functions of the organ results, and eventually with the whole organism. — (*c.*) As regards the animal itself, we find not only single scolices or a single vesicle in such a colony, but the constant production of fresh vesicles with young (daughter- and granddaughter-vesicles), sometimes with, and sometimes without, the production of separate scolices adhering directly to the walls of the vesicle. According to THORSTENSOHN and SCHLEISSNER, the hydatids occurring in Iceland exhibit this structure. "The hydatid sacs," they state, "are formed not only in the human liver, but also in many parts of the abdomen, and are often of enormous size. Hundreds of hydatids are frequently evacuated through the external opening of the sac, or with the stools, and in vomiting. They do not, however, occur only in the interior of the body, but also very frequently in the skin, where they appear like large saccular swellings. The course of the disorder is very chronic." KÜCHENMEISTER states that the vesicles produced do not, like the original mother-vesicle, bear six embryonal hooklets, as they never have occasion for them. The six hooklets may be sought for in vain, even in the mother-vesicle, as, although certainly present, they must, from their extreme minuteness, escape detection on such a large

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* He gives the following definition of its Scolex: — "Vesica animata Echinococco scoliciparienti *similis sed omnino eo multo major* (ad ½ *ped. in diamet.*). Scolices *singuli quiescentes majore hamulorum minorum numero* (46, 52 *et ultra*) *armati parantur, aut ex modo* Ech. scoliciparientis, *aut in gemmis aut capsulis a vesicæ matris superficie interna solutis in quibus iterum scolices et vesicæ secundariæ scolices gignendi si præditæ gignuntur* (mother-, daughter-, and granddaughter-vesicles); *aut fortasse in vesicis, quæ divisione quadam aut sectione ex vesica matre in vasibus animalis hospitis repente et serpente formantur. Vesica mater nihil aliud est nisi vesicula embryonalis* 6 *hamulis armata, et valde amplificata; vesicula filia et neptis hamulis* 6 *destitutæ, quia ex vesicula embryonali rectâ viâ non exortæ sunt.*

"Habitat. *Non solum in homine, sed etiam, auctoribus Haubnero et Creplino, in mammalibus majoribus domesticis, et quidem in diversissimis et hominis et illorum animalium corporis regionibus.* Ovula, *hucusque ignota.*"

vesicle. The smallest of the granddaughter-vesicles are but just visible, and enclose four, five, or more scolices, which adhere peripherically, by a small stalk, to the inner wall of the common cyst, but converge with thin free ends towards the centre of the cavity of the small vesicle. In very large daughter-vesicles scolices also swim about freely. — (*d.*) The scolices produced or *nursed* by the mother-, daughter-, or granddaughter-vesicles, are in general more slender than those of the preceding species: they have the head with the double circlet of hooks, more frequently protruded during life, at least within the larger daughter-vesicles, exhibit distinctly marked sucking-discs, and bear a greater number (46—54) of hooks, which appear more slender than in the preceding species. — (*e.*) The dwelling places of this species are not limited. They may occur in the liver, the lungs, the kidneys, the sheaths of the testicles, the spleen, the ovaries, the breasts, the throat, in the sub-cutaneous tissues, in the bones, &c.—(*f.*) With the increase of the secondary and tertiary cysts in the mother-cyst, the swelling advances; and the more rapidly this takes place, the recognition of the malady and its natural cure are facilitated; inasmuch as the mother-cyst is often burst by the distension, and probably in many cases becomes destroyed. Sometimes, however, the burst colony appears to heal and to recommence the production of fresh daughter-vesicles.

89. *d.* The *prognosis* of this species is more unfavourable than that of the preceding, "although the *diagnosis* is easier, on account of the more rapid growth and greater bulk of the swelling, the occurrence of the hydatid-buzzing, and the more distinct sensation of fluctuation. The structure of the walls of the mother-vesicle is the same in both species, and is characterised by the numerous parallel concentric layers in the substance of the walls, which appear more distinctly marked in the daughter-vesicles, and make their appearance with remarkable clearness after treatment with caustic potash, with the addition of a drop of red ink." (LANKESTER's *Transl. of* KÜCHENMEISTER, &c.)

90. *e. The Diagnosis of Echin. altricipariens.*— The symptoms produced by a colony of these parasites vary with the organ in which it is located, and with the size and pressure of the tumour it developes. At an early stage of their growth these animals generally occasion little inconvenience, and when largely increased in bulk, they produce phenomena which vary little from those occasioned by tumours of the same size, in similar situations. Their superficial or deep-seated positions, and their vicinity to, and pressure upon, nerves and blood-vessels, will also modify effects, or even indicate their existence. But it is comparatively rare to obtain certain evidence of the presence of a colony of *Echinococcus* in the body, unless the passage of the gelatinous vesicles already described from the cavities after the bursting of such a colony, or from the punctures or incisions made into tumours. At the same time, the little scolices of the *Echinococcus* must be found in the vesicles, part of these retaining, others wanting their hooks, their sucking-discs being often indistinct. When the vesicles passed have an opening, the little scolices slip out very easily, and if the structures just mentioned be not found, it is doubtful whether or no a sterile colony or an acephalocyst be present.

91. Before perforation or bursting of the cyst has occurred, the tumour produced by it being very considerable, an examination of it should be made by palpation and percussion, and if there be an obscure or sensible fluctuation, and when aneurismal symptoms are wanting, and when the general health is either good, or not injured to the extent that might be expected from the size of the tumour, if it were of a malignant nature, then an explorative puncture should be made to complete the diagnosis, and the evacuated fluid examined by the microscope in order to ascertain the presence of *Echinococcus scolicis*, or of albuminous gelatinous shreds of *Echinococci*. By these means only can the nature of a cystic or sacculated, fluctuating or elastic tumour be determined, and the existence of these parasites ascertained.*

92. Without these proofs the diagnosis can never be brought beyond one of probability. A sacculated or cystic swelling filled with fluid can alone be inferred. The most useful objective symptoms are the existence of such a tumour, which is elastic to the touch, and of a peculiar consistency

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* ACEPHALOCYSTS. — LAENNEC in 1804 viewed these structures as independent animal organisms. VON SIEBOLD and KÜCHENMEISTER more recently opposed this view; and very lately, the last of these writers, in consequence of his experiments with the eggs of *Tæniæ*, considered *that Acephalocysts are six-hooked cestode embryos, the growth of which has proceeded without hindrance, but which nevertheless have remained barren; or, more correctly, which have never attained to proliferation and the production of scolices.*" If Acephalocysts occur where normally developed *Echinococci* usually have their abode, they cannot be called strayed cestode embryos, but only *cestode embryos which have been disturbed in their normal developement and remained barren.* KÜCHENMEISTER considers the following to be the characteristic marks of Acephalocysts: — 1st. A vesicle adhering to the inner walls of a larger cyst from which it is capable of being detached, or is already detached, in particular spots, but never all over, and collapsed in wrinkles, and which presents very sparing calcification in its white, and scarcely discoloured walls. — 2nd. The transverse section exhibits walls consisting of distinctly developed, parallel, concentric layers. — 3rd. The walls have a peculiar, elastic gelatinous trembling.— 4th. The contents consist of a watery fluid, or of a substance of a purulent consistence, and contains the microscopic elements of calcifying encysted proteine masses in the act of resorption. — 5th. The vesicle sometimes conceals, in its interior, secondary cysts, with gelatinous walls, in which, however, we seek in vain for scolices of cestodes or their remains, especially their hooks. "The Acephalocysts which are referred to here belong to the following three species of Tæniæ:—1. Acephalocysts derived from *Tænia Echinococcus scolicipariens*. Many of those acephalocysts which bear no daughter-vesicles in their interior, must be referred to this species. 2. Acephalocysts derived from *Tænia Echin. altricipariens*. These are acephalocysts with a formation of daughter-vesicles. 3. Acephalocysts derived from *Tæniæ ex Cysticerco tenuicolli.*" KÜCHENMEISTER remarks respecting these last that what ESCHRICHT regarded as possible, has since proved to be the case; for that in one administration of eggs of *T. ex Cyst. tenuicolli* to a lamb, he found a sterile *Cysticercus tenuicollis* in the midst of other equal-sized and fully developed *Cysticerci* of this species. This sterile individual bore perfectly distinct indications of life. All structures, he adds, which are really acephalocysts, and which are living sterile specimens of *Cysticerci* and *Cœnuri*, are distinguished from those derived from *Echinococci* in that the walls of the latter consist of very distinct concentric layers, tremble like jelly, and are extraordinarily elastic; whilst the walls of the analogous structures derived from *Cysticerci* are considerably thinner, have not the elastic consistence of jelly, and consist of such fine and delicate concentric layers as hardly admit of detection. Such being the origin and nature of *Acephalocysts*, it is obvious that the phenomena produced by them cannot be materially different from those caused by the two species of *Echinococcus*.

The subject of *Acephalocysts* has been already treated of under the article HYDATIDS; but instead of viewing them as in that article, as independent organisms, the more recent Continental microscopists and experimenters have shown them to originate as now stated.

and form, in places where swellings do not usually occur; but, when those do make their appearance, they are generally *Echinococci*. The highest degree of probability that an unopened tumour belongs to a colony of *Echinococci* is attained when the swelling occurs in places such as the liver, spleen, kidneys, lungs, breast, testicles, throat, &c., where *Echinococci* are otherwise brought to light, either artificially or naturally. On *percussion*, the finger, placed over the swelling, often feels a trembling or oscillation of the mass underneath it, especially when several gelatinous tremulous cysts are inclosed within a larger vesicle; these being set in motion by the percussion appear to produce this trembling or oscillation, which however frequently is not felt.

93. *f. The Etiology of the Echinococci* is manifestly the ingestion of one or more of the eggs or six-hooked embryos of the *Tænia Echinococcus altricipariens*, at some time of the life of the patient. The mode of life of persons in some localities, and in some circumstances, may be favourable to the passage of the eggs of this *Tænia* into the stomach; and it is now well understood that certain *Cestodea* often have a very limited habitat. "The *duration of the life* of the *Echinococcus* does not appear to be very short. According to ESCHRICHT, one patient must have borne his colony eighteen years."

94. *g. The Prognosis of the Echinococci* varies according to the organ in which they are seated, to their situation in that organ, and to the primary and consecutive injuries caused by them to the organ and to the whole system. But the prognosis is upon the whole more favourable than is generally supposed, especially when the general health and the powers of vital existence are duly promoted. "The tumours, when they are accessible, are amongst the number of curable tumours; they may cure themselves by bursting, and when they are once got rid of, relapses in the same colony are rare and exceptional cases, and every *Echinococcus* produced usually owes its existence to a new immigration of embryos. But for this very reason the continuance of the mode of life in endemically affected places furnishes a more unfavourable prognosis. The natural cure by the bursting of the colony, and the passage of daughter-vesicles may be accompanied by symptoms dangerous to life, or if it take place in the direction of the larger bronchi, by difficulty of breathing, or may even lead to actual suffocation." (*Op. cit.* pp. 227, 228.)

95. *B.* Sub-order, TREMATOIDEA—SYNON.—*Myelmintha*, DIESING; *Egelwürmer*; *Platyelmintha isolata*, Isolated flat-worms, KÜCHENMEISTER.

DEFINIT.—"*Animalia solitaria, plerumque hermaphroditica, rarissime sexu distincto, et poris plerumque suctoriis, medianis aut lateralibus instructa. Canalis cibarius furcatim divisus aut ramosus, rarissime simplex. Evolutio fit plerumque metamorphosi et sæpissime generatione alternante, rarissime sine illis.*"—LEUCKART.

96. This *sub-order* is divided by KÜCHENMEISTER into two *Families*, the *Monostoma* and the *Distoma*.

97. (*a.*) MONOSTOMA.[*]—SYNON. *Cucullanus*; *Festucaria*; *Fasciola*; *Amphistoma*; *Distoma*; *Monostoma*; *Monostomum*.—It is very doubtful whether or no any species of Monostomum has been found in the human body. Professor JÜNGKEN was said to have found eight *Monostoma* in an incipient cataract; and hence Von NORDMANN named the species *Monostomum lentis*.

98. (*b.*) DISTOMA[*] (KÜCHENMEISTER):—*Distomum* (DIESING).—*a. Distoma hepaticum*[†]—*Distomum hepaticum.*—The fully developed *Distomum hepaticum* has been minutely described by KÜCHENMEISTER, but I must refer the reader for his description to his work, or to its excellent translation by Dr. LANKESTER.—*a.* I may, however, briefly state that its *skin* and *parenchyma* consist of muscular layers—of longitudinal, transverse, fusiform, and short fibres; that its organs of sense are wanting, and its nervous system has not been described; that its alimentary apparatus presents a mouth, pharynx, and excretory organ; that its *female* sexual organs lie towards the ventral surface of the animal, and consist of a germ-stock, with its efferent duct, two vitelligines, a short oviduct, a sac-like uterus, and a vagina; that its *male* sexual organs consist of testicles, a ductus spermaticus, a vesica seminalis, and a penis; and that "the *Distoma* are hermaphrodites, with the following sexual actions: self-impregnation with and without copulation, and impregnation and

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[*] "*Corpus depressum vel teretiusculum. Caput continuum, vel collo discretum. Os terminale vel anticum, ut plurimum acetabuliforme, integrum, crenulatum, inerme vel armatum. Apertura genitalium perclara, duplex; mascula infra os, interdum acetabuliformis, pene protractili; feminea pone masculum, minima, ut plurimum inconspicua. Porus excretorius supra caudæ apicem antico margine caudali. Animalia mammalium, avium, amphibiorum et piscium corpora,* i. e. *præter tractum intestinalem organa varia inhabitantia, libere aut folliculis inclusa.*" (DIESING.) *Metamorphosis et generatio alternans inter evolutionem, uti in Distomis.* The ventral sucker is therefore deficient, and DIESING gives a warning, "*Cave, ne Bothriocephalidearum articulum solitarium pro* '*Monostomum*' *habeas, aut porum genitalem, interdum callosum, cum acetabulo confundas.*"

[*] "*Corpus depressum vel teretiusculum, armatum vel inerme, Caput continuum, vel collo discretum. Os terminale, vel anticum, ut plurimum acetabuliforme. Acetabulum unicum ventrale sessile, vel pedicellatum, medianum, ab extremitate postica plus minusve remotum. Aperturæ genitales approximatæ, sæpissime ad exitum conjunctæ (cloacâ instructæ), supra vel infra acetabulum sitæ. Animalia plerumque hermaphroditica, rarissime sexu distincto. Ovula embryones parentibus rarissime similes, plerumque dissimiles aut fimbriatos, aut fimbriis destitutos continentia, quare evolutio fit metamorphosi et generatione alternante.*

"Statu immaturo *aut libere in natura vagantia, aut in organorum parenchymate, imprimis in animalibus inferioribus inclusa.* Statu maturo *entoparasita animalium præprimis vertebratorum, aut libere in variis organis et cavitatibus apertis et clausis viventia, aut in folliculis inclusa.*"—DUJARDIN et DIESING.

[†] "*Corpus planum, armatum, saltem in juventuli, ætate magis profectâ adhuc in collo. Individua juniora* 4'''=9 *mill. longa,* 1½'''=3·3 *mill. lata; adulta* 8–14'''=18–31 *mill. longa,* 3½–6'''=8–13½ *mill. lata.*

"*Collum subconicum, breve. Os haud nodulosum, terminale, triangulare,* 1·4 *mill. latum. Acetabulum* 1·5 *mill. latum, ore majus superum ad colli basin, aperturâ triangulari,* 3–4 *mill. pone os situm.*

"*Orificia genitalia fere contigua, mediâ in parte inter os et acetabulum sita. Penis cylindricus,* 3 *mill. longus,* 0·5 *mill. latus, falciformis, prominens, uncinulis parvulis armatus. Testiculi maximâ ex parte mediâ in corporis posterioris parte siti, ex trunco mediano et ramificationibus, ad finem cæcis, compositi. Organa vitellina ad latera animalis sita, inter se horizontali quodam et transverso ramo conjuncta et statim in uterum simplicem magnitudine crescentem, multifarie volutum transeuntia. Ovula flava, mitra quadam parvula aut obtegulo, dehiscentia,* 0·056–0·063''' (*V. et Par.*)=0·126–0·144 *mill. longa, et* 0·035–0·038'''=0·079–0·086 *mill. lata.*

"Embryones Cercariarum utriculi *aut Rediæ, nec minus* Cercariæ liberæ, *si omnino hæc forma præbetur, ignotæ. Migrationum modus nondum cognitus.* Distomum juvenile immaturum *semel sub cute humanâ inventum.*"—KÜCHENMEISTER.

copulation with a second individual." This *distoma* occasions great devastation in the livers of herbivorous and domestic animals, especially in wet seasons; but it very rarely occurs in man.

99. *b. Diagnosis.* — *Distoma* in the liver causes dilatation and inflammation of the gall-ducts, and destruction by pressure and disappearance of large portions of the parenchyma of the liver in the vicinity of the enlarged ducts. These changes, however, cannot always be recognised, or referred to their true source in the human subject, as several lesions of the biliary organs and apparatus occasion the same symptoms as they produce. The *distoma* may even cause many of the phenomena of gall-stones passing along the ducts, with or without more or less of jaundice; but these cannot assist in establishing a diagnosis, the passage only of the animals with the fæces or with the matters vomited being the only proof of their presence in the human subject.

100. *c.* It is obvious that no *prognosis* of the *Distoma malady* can be formed unless the animal be discharged and recognised. When this takes place, although the prognosis is upon the whole unfavourable, yet there may not be any immediate danger. The life of the patient may be prolonged or even a recovery ultimately obtained, by promoting the secretions and excretions by suitable means, and by supporting vital force and resistance.

101. *β. Distoma lanceolatum*[*] (MEHLIS). This species was seen in the human subject by BUCHOLZ, CHABERT, and MEHLIS. It is narrow and elongated, and distinguished by its long neck, by the want of any spinous coat, and by the female organs especially occupying the abdomen, and the testicles the anterior part of the body. SCHAEFFER, RUDOLPHI, and MEHLIS established this as a distinct species of Distoma, and showed that GOEZE, ZEDER, BREMSER, were wrong in regarding it as a young *Distoma hepaticum.* It is stated by KÜCHENMEISTER to be less injurious to the structure of the biliary apparatus than the *D. hepaticum.* The *diagnosis* is possible only when it passes off. The *prognosis* is probably more favourable than in the case of the other parasite.

102. *γ. Distomum heterophysis*[†] (VON SIEBOLD). —This parasite has hitherto been found only in two instances, but in very great numbers, in the small intestines, by BILHARZ. Its influence on the animal economy is unknown. It is unnecessary to give a further description of it than that contained in the subjoined definition.

103. *δ. Distomum hæmatobium*[*] (BILHARZ).— —*a.* This parasite was first found in 1851, in the blood of the portal vein. It appeared as a white elongated entozoon, resembling a nematoid worm when examined with the naked eye; but was found to be *Distomum*, with a flat body and a cylindrical tail ten times as long as the body. This tail was no loosely attached, deciduous portion of the body, as in the *Cercariæ*, but a continuation of the body of the worm itself, which was flat and rolled towards the ventral surface. This first animal found was clearly recognised as the male; another subsequently found in one of the mesenteric veins of the same subject was ascertained to be the female. For a minute description of the sexual organs, eggs, and developement of this animal, I must refer the reader to KÜCHENMEISTER's work. It may, however, be stated that, according to Professor GRIESINGER, this parasite is so extraordinarily abundant in Egypt as to have been found 117 times in 363 dissections. It would appear that the *Distoma* get into the blood-vessels and lay their eggs, which at last escape from the ruptured vessels in the intestinal and urinary mucous surfaces. Dr. REINHARD saw, hanging out of a vessel accidentally opened by KÜCHENMEISTER, one of these *Distoma*, which bore his female with him. The action of their eggs and embryos on the mucous coat of the intestines and urinary organs, and on the biliary apparatus, is of a very dangerous nature.

104. *b. In the intestines* are found deposits upon and beneath the mucous membrane, verrucose

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[*] "*Corpus læve, lanceolatum, planum, aliquid pellucidum, aut ovulis flavofuscum,* 4·5—12 *millim. seu* 2—6''' *longum,* 2 *ad* 2·2 *millim. aut* 1—2''' *latum in anteriore parte tenuius, acetabulo finitum, in posteriore aliquid obtusum. Collum continuum, conicum, planum, longius quam in* D. hepatico. *Os fere terminale, globosum,* 0·48 *mill. latum, acetabulum orbiculare,* 0·48 *mill. latum,* 1·1 *mill. pone os situm, ore majus. Œsophagus* 0·48 *mill. longus, bulbus œsophagi* 0·10 *mill. latus; intestinum bifurcatum, rectum, simplex, non amplius ramificatum,* 0·04 *mill. latum.*

"*Genitalia inter os et acetabulum ventrale sese aperientia, inter intestini bifurcationem sita. Vesica seminalis exterior=cirrhus claviformis; funiculus spermaticus flexuosus; penis longus, cylindricus, plerumque rectus; testiculi* 2 *majores et tertius minor vesicam seminalem internam exhibens; unus pone alterum et pone acetabulum ventrale siti, vix lobati. Organa vitellina multo minora, quam in* D. hepatico, *albida, lateralia, ramificata,* 1—1½ *mill. longa, in ovarium et uterum intrantia, longiora quam in* Dist. hepatico *et tenuiora, sed colore obscuriore prædita, multifarie voluta. Ovula multo minora, quam in* Dist. hepatico, 0·041 *mill.*= 0·018''' *Par.* 0·0185''' *Vienna longa, et* 0·0246 *mill.*= 0·0108''' *Par.* 0·011''' *Vienna lata, sed in statu maturo multo obscuriora quam in* D. hepatico, *et nigro-rubra.*

"*Systema excretorium: Vasa lateralia, ad collum usque prominentia, ibique recurrentia et intumescentiâ minore, ad animalis apicem sitâ, finita.*" — KÜCHENMEISTER.

[†] Descriptio. "*Dist. heter., hermaphroditum. — Corpus ovato-oblongum, depressum, subtus planum, supra leviter convexum. Acetabulum oris subapicale, infundibuliforme, parvum. Acetabulum ventrale paululum ante medium situm, magnum (acetabulum oris decies et ultra superans), globosum. Pharynx muscularis, globosa; canalis cibarius ante acetabulum ventrale in* 2 *partes cæcas divisus. Cirrhus post acetabulum ventrale situs, et oblique cum sinistrâ ejus parte coalitus, globosus, acetabuliformis, circulo incompleto setarum* 72 *minutissimarum, ramulis* 5 *secundis instructarum coronatus, testiculis organoque germinifero globosis. Longitudine* ½—¾''' ; *latit.* ¼'''.

"Patria. *Ægyptus; in hominis intestino tenui bis repertum, numero permagno.*" — KÜCHENMEISTER.

[*] Descriptio vermis secundum BILHARZ. "*Distomum hæmatobium, sexu distincto. Maris corpus molle, albidum, filiforme, parte anteriore totius longitudinis octava vel nona* ('*trunco*') *depressa, lanceolata, subtus plana vel concava, supra leviter convexa, superficie lævi, reliqua corporis parte* ('*cauda*') *terete, margine corporis ab acetabulo ventrali retro utrinque versus faciem ventralem conflexo, eoque modo canalem* '*gynæcophorum*' *efficiente, apice postico, attenuato, superficie externa tuberculis piligeris conferta, superficie canalis interiore linea mediana lævi et partibus lateralibus aculeis minutissimis scabra. Acetabulum oris apicale subinferum, triangulare. Acetabulum ventrale sub finem* '*trunci*' *insertum, orbiculare eadem magnitudine cum acetabulo oris. Superficies utriusque acetabuli granulis crebris minutissimis scabra. Canalis cibarius sine pharynge musculari ante acetabulum ventrale in* 2 *partes divisus, in posteriore* '*caudæ*' *parte denuo unitus, cæcus. Porus genitalis inter acetabulum ventrale et canalis* '*gynæcophori*' *originem situs.*

"*Feminæ forma dissimilis, tenerrima, gracillima; corpus tæniæforme, læve, hyalinum, antice sensim valde attenuatum, cauda canali nullo apice angustata. Acetabula et canalis cibarius, ut in mare. Porus genitalis cum margine posteriore acetabuli ventralis coalitus.*

"*Longit.* 3—4 *lin.; mas feminam latitudine multo superans.*

"Patria. *Ægyptus; in hominis vena portarum ejusque ramificationibus et in vesicæ urinariæ parietibus. In venis meseraicis reperiuntur mares feminam in canali gynæcophoro gerentes, in venis intestinalibus et hepaticis, in vena lienali semper vidui.*"

and lobate fungous excrescences, and also the aggregations of the eggs in the vessels of this membrane, "where the eggs are often fixed in rows in the mucous and sub-mucous tissues, in and beneath the croupous exudations upon the intestinal ulcers; and, lastly, after the rupture of the vessels upon the free surface of the mucous membrane."

105. *c. Action on the Liver.*—"The entire trunk of the portal vein is sometimes filled with mature animals, with eggs in the substance of the liver; and it is not impossible that the *Distoma* situated in these places may give rise to a tough, dry, anæmatous consistence of the liver, or perhaps even to abscesses."

106. *d. The alterations in the urinary bladder* produced by *Distoma hæmatobium* are at first circumscribed spots of hyperæmia, with bloody extravasation and swelling of the mucous membrane, or tenacious mucus, with greyish-yellow masses of exudation, in which the eggs are imbedded. "It is rare that the whole inner wall of the bladder is injected and ecchymosed. The urine is mucous, but pale and clear; and BILHARZ found eggs in the urine passed." In later stages, yellowish discoloured elevations, mixed with many pigment spots. These elevations often form a soft coat, sometimes a line in thickness, mixed with bloody extravasations, firmly attached to the mucous membrane. Sometimes calcareous incrustations of the egg-shells, the deposition of the salts of the urine, and the aggregation of eggs, give the whole a sandy texture. Very rarely this coating covers true ulcers with loss of substance. At other times, single or aggregated vegetations, varying from the size of a pea to that of a bean, of a yellowish colour or ecchymosed with blood, are found on the vesicle mucous surface. In the smooth-edged spaces of these vegetations, sitting in the sub-mucous tissue, formed by the diverticula of its vessels, and only constituting productions of the vessels, BILHARZ first found the Distoma, and in the mucus and exudation over these spots their eggs. We may conclude from this that the Distoma collect there, and in similar situations, to lay the eggs which are to be passed off.

107. *e. The mucous membrane of the ureters*, either alone or with that of the bladder, or even with that of the pelvis of the kidney, in rare cases, is attacked in a similar manner. A gravelly matter, in molecular masses of imbedded eggs of *Distoma*, either empty or containing embryos, with blood, exudation corpuscles, and crystals of uric acid, is sometimes passed in the urine. Individual embryos also occur free, but GRIESINGER found these in a dead state only. In consequence of the thickening of the inner coats of the ureters, complete or partial occlusion of these ducts with dilatations above it, with retention of urine and its consequences, sometimes supervene. The kidneys are somewhat swollen and congested with blood, and the mucous membrane of the pelvis is much injected. The kidneys, in rare instances, ultimately degenerate in a fatty or suetty state. "The aggregation of eggs of the *Distoma* are not unfrequently the nuclei of deposits of gravel and stones, consisting chiefly of crystals of uric acid, in the kidneys, ureters and bladder, and thus give rise to the well-known consequences of stone and gravel. This is the *Lithiasis* of the Egyptians, described by PROSPER ALPINUS in "Medicina Ægyptiorum."

108. The seasons appear to have some influence upon the frequent occurrence of this worm, as it has been observed to be more abundant from June to August, and more rare in September, October, and January. This difference is probably owing more to the kind and quality of the food in these months, than to temperature or season.

109. *f. The symptoms* of this parasite are manifested chiefly in the urinary apparatus, and in the urine itself, at an early period of the lesions produced by it. Causeless hæmaturia, especially if frequent, and attended by anæmia, emaciation, and disordered bowels, should be a cause of suspicion, especially in tropical countries. The *diagnosis*, however, during life, can be certain only when the eggs are found in the bloody urine and in other evacuations, as they were by BILHARZ.

110. *ι. Distomum ophthalmobium* * (DIESING). — This parasite was found in the eye of an infant, between the lens and the capsule, by GESCHEIDT. The infant was five months old, and was born with *cataracta lenticularis*, with partial suffusion of the capsule. Four specimens of this *Distoma* were found, and were recognisable by the naked eye.

ii. Order, NEMATELMIA — NEMATOIDEA. — Thread-worms, Round-worms.

111. The worms now to be treated of are the *First Order* of RUDOLPHI.—"*Nematoidea: Corpore elongato, tereti, elastico.*" DIESING, in his "*Systema*," arranges them as the *Sixth Order* of his *first sub-class*, and *defines them* —"*Nematoidea: Corpus elasticum, cavum, subcylindricum; tractus cibarius simplex; caput in proboscidem haud protractile. Endoparasitica, tandem rarius extus libere vagantia.*" They form the *second order* of KÜCHENMEISTER's *second sub-class*, and he *defines them as follows*:—"NEMATELMIA: Corpus *teres, elasticum, sæpe attenuatum, filiforme; ore centrali, vel sub-centrali; canalis cibarius aut distinctus aut obsoletus, anoque destitutus.* Metamorphosis *in paucissimis.* Migrationes *activæ aut passivæ in permultis.*"

112. *Mature Nematode Worms* are met with in the human subject in the cavities of the body, having mucous surfaces, in the sub-cutaneous cellular tissue, with an artificial external communication, and during their youth, and in an immature state, in various muscles, especially primitive muscular fasciculi. The division of this order of worms into numerous genera and species has been attempted by DUJARDIN, VON SIEBOLD, DIESING, and others, but without sufficient agreement to admit of further reference to it than is made by KÜCHENMEISTER, who does not adhere to a strict classification, but rather reviews them in accordance with their dwelling place in the human body, and selects for them the name most generally employed. It was formerly thought that the *Nematoidea* were the most accurately known of *Entozoa*; but at the present day we have more positive knowledge of the history and developement of the Cestode Worms, and even of the *Trematoda*, than of this, the order of Round worms.

113. "The distinct presence of a digestive

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* "*Corpus ovato-lanceolatum, depressum, variabile. Collum breve subcylindricum. Os terminale orbiculare. Acetabulum ore ⅓ majus, subcentrale, apertura circulari. Longitud.* ¼–⅓'''; *latitud.* ¼'''."—DIESING.

apparatus, divisible into mouth, œsophagus, stomach, intestine, and anus, the separation of the sexes into two individuals, the certain detection of a nervous system in some of them, and the apparently jointed structure of the round worms, bring them near to the Articulata. In the human subject we must take into consideration — 1, the *Trichocephali* and *Trichinæ*; 2, the *Oxyuri*; 3, the *Strongyli* and *Ancylostoma*; 4, the *Filariæ*; and 5, the *Ascarides*." (*Op. cit.* p. 289.)

114. A great part of the Nematode worms appear to reach maturity only after they have undertaken various immigrations and emigrations during their youth. One species of round worm common to man is to some extent capable of migration also in the mature state. The migration in the early stage of developement consists of the escape outwards of the eggs of these worms with the human fæces, with which they get into dunghills, sewers, &c., and experience the transitions described above (§ 7, *et seq.*). My limits admit not of an account of the sexual and other organs of this order of worms, and of the various stages of their developement; sufficient reference to these topics for practical purposes has already been made, and the reader may further peruse the minute descriptions of KÜCHENMEISTER and VON SIEBOLD, and of other recent observers, to whom I have referred.

i. TRICHOCEPHALUS.[*] — SYNON. *Trichuris*, ROEDERER; *Ascaris*, LINNÆUS; *Mastigodes*, ZEDER; *Trichocephalus*, GOEZE, DIESING, DUJARDIN, &c.

115. 1st. *Trichocephalus dispar*[†], with its progeny known as *Trichina spiralis*[‡], OWEN and LUSCHKA.

SYNON. *Trichocephalus dispar*, GOEZE; *Trichuris*, ROEDERER and WAGLER; *Ascaris*, LINNÆUS; *Mastigodes*, ZEDER; *Trichina*, *Filaria*, Auct.; *Trichura*, Fr.

116. *A.* This worm was first discovered by MORGAGNI in the cæcum and vermiform appendage of typhous patients; and ROEDERER and WAGLER, in 1761, recognised it as a distinct worm, in the "*morbus mucosus*," or mucous fever, so prevalent in Germany in the middle of the eighteenth century. It was long supposed to exist only in the intestines of typhous patients, but it is now fully ascertained to have no particular relation to any disorder of the human bowels. It is found chiefly or only in the lowest region of the small intestine, near the ileocæcal valve, in the cæcum, and colon. From the dingy colour of the worm, it is liable to escape detection, and only is detected with ease when the lower intestines are free from their thick and coloured contents, as in disorders attended by diarrhœa. If carefully sought after, these worms will be found more frequently and in greater numbers than is commonly believed. RUDOLPHI found many hundreds in the situations just named. BELLINGHAM saw upwards of 100 in the cæcum only of one patient in Dublin. They occur in both children and adults, and in Europe and Africa. KÜCHENMEISTER's work and its translation by Dr. LANKESTER, contain very minute descriptions of the organization of this parasite. The subjoined systematic description is sufficient for all practical purposes.

117. *B. Trichina spiralis* (OWEN and LUSCHKA), *as the brood of Trichocephalus dispar, engaged in migration.*—This asexual worm was first described by OWEN in 1835, although previously seen by TIEDEMANN in 1822, and by HILTON and WORMALD in 1833. It was afterwards seen and described by PAGET, KNOX, and others. The seat of this worm is, as is well known, the muscles of voluntary motion, and indeed all the muscles excepting the heart and the sphincter ani, where it has not yet been found. In the places where capsules of *Trichina* are seated, fatty tissue is constantly inserted, chiefly at their anterior and posterior extremities; the fat being apparently deposited to fill up the space produced by the *Trichina* having penetrated between the muscular fibres.

118. *a.* The *developement* of *Trichina spiralis* seems to be as follows: — "When a human being

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[*] Descript. Systemat. — "*Corpus longissimum, ex 2 partibus formatum, quarum anterior tenuior, filiformis, posterior crassa, organa sexualia continens.*

"Mas: *tenuior quam femina; penis simplex;* organon copulatorium auxiliare *spinosum, ex 3 branchiis compositum.*

"Femina: *mare major et crassior;* vagina *musculosa in abdomine sese aperiens*; *uterus simplex;* ovarium *simplex.* Animalia ovipara, *vix aut rarissime* vivipara.

"Ovula *oblonga, subfusca, in utraque extremitate collo quodam parvulo prominente ornata* (en une sorte de goulot court, *Dujardin*)."—KÜCHENMEISTER.

[†] Systematic description of *Trichocephalus dispar.* — "Cutis *transversa striata, marginales rugas ad anum versus magnitudine adductas exhibens. Caput* 0·02 *mill. latum, retractile, obtuso-acuminatum, interdum perparvâ papillâ instructum. Tractus intestinalis constituitur ex œsophago ab initio recto, angustissimo paullo post toruloso, sensim per totum collum intumescente; ventriculus pyriformis, ad latera sua glandulas* 2 *perparvas aut appendices alosas aut nervorum ganglia gerens. Animalia fæcibus humanis pro nutrimento utentia.* Mas: *omnino colore clarior, fusco-albior; circiter* 37 *mill. longus (caput et collum* 22; *truncus aut abdomen* 15); *in trunco* 0·5 *mill.*—1·0 *mill. latus; formam spiralem amans. Testis et funiculus spermaticus simplex ad intestini tenuis formam volutus; unâ cum tubo intestinali ante anum in cloacam communem apertus. Penis simplex;* 3·35 *mill. longus;* 0.042 *mill. ad extremitatem infundibuliformem,* 0·027 *mill. ad apicem versus latus; vaginâ lævi cylindricâ instructus. Extremitas caudalis organo copulatorio auxiliario, spinis armato, subcylindrico ornata, cujus longitudo* 0·451 *mill.*=0·198''' *Par.* =0·203''' *V., latitudo in parte libera* 0·090 *mill.*=0·039''' *Par.*=0·040''' *V., in parte opposita fere* 0·049 *mill.*=0·0216''' *P.*=0·022''' *V. est. Cloacæ communis musculosæ in maribus longitudo circiter* 4 *mill.*=2''' *P.; latitudo* 0·261 *mill.*=0·116''' *P.*=0·119''' *V.; latitudo foraminis cloacæ ipsius*=(the lumen of the canal formed by the cloaca) 0·130 *mill.*=0·058''' *P.*=0·059''' *V. Spermatozoida globuliformia ad* 50 *mill. longa.*

"Femina: *in trunco rectior, minus curvata, mare aliquid latior, minusque elastica et flexibilis, ob ovulorum in utero et in ovariis copiam, eaque de causa colore magis fusca; extremitate caudali obtuso acuminata.*

"Ovula *fusca cum generis speciminibus;* 0·054 *mill.*= 0·023''' *P. et V. longa; media in parte* 0·025 *mill.*= 0·0112''' *P. et V. in apicibus* 0·01 *mill.*=0·0048''' *P. et V. lata. Embryonum migrationes adhuc ignotæ. Verisimillimum est, Trichinas, quas dicunt spirales, Trichocephali disparis embryones esse.*"

[‡] Description of *Trichina spiralis.*—"*Corpus plerumque in spiras* 2 *retortum, ad anum versus crassius et obrotundatum, ad caput attenuatum; tubus intestinalis, uti apud Trichoc. disparem, ab initio multifarie retortus, ventriculus pyriformis cum lateralibus* 2 *appendicibus alosis (lobulis aut glandulis aut nervis), intestinum rectum post coarctationem quandam iterum incrassatum, rectâque viâ ad anum in extremitate posteriore eâque crassiore apertum profectum. Funiculus quidam secundus in utrâque extremitate cæcus et semilunaris genitalium primordia format* (?).

"*Longit. vesicularum* 0·2—0·5—0·7'''=0·4—1·0—1·5 *mill.; latitudo fere medium partem exhibet.*

"*Longitudo vermiculi ex cystide liberati et evoluti secundum* LUSCHKA ½—¾'''; *secundum meas mensuras* 1·115 *mill.*=0·50''' *P. et* 0·518''' *V.; latitudo in capitis apice* 0·008 *mill.*=0·0036''' *P. et* 0·0037''' *V.; latitudo extremitatis posterioris seu ani* 0·024 *mill.*=0·0108''' *P.* =0·111''' *V.*"—KÜCHENMEISTER.

has swallowed the eggs, or the youngest brood developed into ready-formed embryos which occur in the eggs, or perhaps also when any female *Trichocephali* residing in the small intestine scatter their eggs with the ready-formed embryos in them, and when in either case the egg-shells are burst, and the embryos set free in the intestinal canal, the desire of migration awakens in them, and they set out, like the embryos of many other *Nematoda*, in the shortest and easiest way towards the tissues which they prefer as their resting place." That in this case, as in that of the *Cestodea*, the digestive canal may be the place of immigration from the exterior, is shown by the fact that the muscles of the tongue, pharynx, and œsophagus, as well as the sphincter ani internus, are visited by the *Trichinæ*. In some cases the blood may be the bearer of the migrating brood. Meissner found the young attached to the inner walls of blood-vessels, and of the heart; and both he and Leuckart think that, the circumstance of the brood of cestode worms being found so abundantly in the blood-vessels, shows that the blood is their most usual course of migration. Küchenmeister believes that both courses of migration are followed by penetrating the tissues, and by the blood. The *Trichina* having found a resting place, a cyst closely adhering to the tissues is formed around it. This cyst consists of concentric layers of a fibrous or lamellar substance, with imbedded cell-nuclei. The brood reposing in this cyst approximates the head and caudal extremities in spiral turns, without, however, contracting a part of the head, and is then perhaps surrounded, even on the part of the worm, with a peculiar layer, but certainly enveloped on the part of the host, with a capsule and cyst, in which the worm increases in size; and, besides the intestinal canal, developes the primitive foundations of an organ which belongs to the generative apparatus. The material for the capsule or cyst enveloping the *Trichina*, according to Luschka, is formed from the inflammatory exudation produced by the passage and site of the worm; and hence the cyst varies in appearance with the time which has elapsed since the immigration, the oldest cysts exhibiting granules of lime-salts combined with an organic substance, this deposition of lime-salts increasing with the age of the cyst. Sanders and Kirk state that there are around the worm — 1, an external fibrous envelope; 2, a tolerably thick layer of a white, transparent, homogeneous substance; and 3, an internal round capsule.

119. *b.* The *contents* of the cyst consist of one or more animals, and a small quantity of fluid, which keeps the inner envelope extended (which envelope Küchenmeister and Luschka believe to be derived from the animal itself); the fluid is sometimes clear, especially in the comparatively young *Trichinæ*. In cysts with worms recently dead or destroyed, it showed traces of organic decomposition. In cysts with worms which have been long dead, or in those which contained no worms, which are rare, is found a clear, thickish fluid, with small formative elements, or only a few elementary granules. These wormless cysts probably had previously enclosed a *Trichina*, which had died, and that a complete solution of the worm had taken place, or which had migrated from the cyst, and wandered to some other situation, where it had again become encysted.

120. As to the destination of the *Trichinæ*, there is no doubt that a great number, if not all, of those which occur in the muscles of man, become abortive and die. The latter then lie in their cysts, in the midst of the cyst-fluid, which is in course of sebacification, desiccation, and calcification, rolled in spiral convolutions, in the same way as the *Trichinæ* seen in a living state. These spiral structures are, however, broken up into fragments, which indicate a ringed appearance or a segmentation of the bodies of these animals. "But how these encysted nematode worms, with our present state of civilisation, can reach, before the period of their death — which, however, only occurs very late, perhaps in 30 to 40 years, or after a still longer period in particular cases — places in which they are in a position to pass through their further and higher development, is beyond my power to divine" (Küchenmeister). On this subject, the experiments of this writer, and of Zenker and Leuckart, have thrown no light.

121. *c.* The reasons which have induced Küchenmeister to regard the *Trichina* of Owen and Luschka as the young brood of *Trichocephalus dispar*, and to consider both these nematode worms, hitherto placed separately as belonging to one species, are the following: — 1. The *skin* of both has a peculiar ringed and jointed structure, which presents itself more distinctly than in many other *Nematoda*. 2. In both, a *longitudinal stria* runs down the sides, indicating the limit to which the contractile parenchyma of the worm, in which its internal organs are imbedded, reaches. These striæ are certainly the points of attachment of the parenchyma to the inner wall of the integument of the *Trichina*. 3. The *alimentary canal* is organised in exactly the same way in both. The mouth and anus are situated exactly in the centre of the two extremities of these bodies, the anterior and posterior; this circumstance excluding the *Ascarides*, *Oxyurides*, and *Strongyli*, and most of the *Filariæ*, from any relationship with *Trichina spiralis*. 4. The *second tube* which occurs in the abdomen, together with the intestinal canal, favours the identity of the two worms; the course of this tube admitting of being so developed as to produce either female or male *Trichocephali*. For these reasons Küchenmeister regards the *Trichinæ* as the brood of *Trichocephali* engaged in migration, by swallowing which we infect ourselves with the *Trichocephalus dispar* of both sexes. The *symptoms* produced by these worms have not been observed or stated. Even the immigration of the brood of *Trichina* appears to take place without any general reaction, and is also borne without injury for many years.

122. ii. Oxyuris=*sharp-tail* (from ὀξὺς and *οὐρά*). This name applies only to the female, but by no means to the male. This worm is differently classed by Dujardin and Diesing, whose classifications are too artificial, and too subdivided to admit of notice at this place. The *Oxyuris*, according to Dujardin and most other authors, is a *genus* of *Nematoda* separated from *Ascaris*. This writer gives the subjoined systematic description of it.*

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* "*Corpus cylindricum aut fere fusiforme, sublongum, in feminis retrorsum subulatum; caput inerme; os rotundum* (*in statu contractionis*) *aut triangulare* (*in statu*

123. *A. Oxyuris vermicularis*, Bremser, Dujardin, Von Siebold, Goeze, Rudolphi, Diesing, &c.; *Fusaria vermicularis*, Zeder; *Kinder-, Mastdarm-, Madenwurm*; Thread-worm.* — *a. Three forms as to size, sex, &c.*, of these worms are met with:—1. *The mature females*, which are remarkable for their size, thickness, and whiteness, for their acute capillary tail, and for an obtuse, broad head. 2. *The young immature females* resemble the pale-gray colour of the males, but they are somewhat larger than they, and are recognised by their acute tails, and by the female sexual organs in grades of developement varying with their age. 3. *The mature males* are remarkable by their pale silver-gray colour, and their obtuse anterior and posterior extremities, as also by the penis. All the three forms occur abundantly in one and the same intestine. The skin, head, and œsophagus, and intestine are similar in both sexes. The nervous system of the *Oxyurides* is, according to Walter, greatly developed, although hitherto overlooked. They have both cephalic and caudal ganglia, with other ganglia, plexuses, and lateral filaments, which are minutely described by Walter and Küchenmeister. The primitive nervous filaments are produced from the processes of the ganglionic cells; by the union of several primitive filaments of this kind, narrower or broader branches are produced. The skin of the oxyurides consists of an external *epidermis*, and beneath this a delicate but densely fibrous corium. The *parenchyma* of the body does not extend into the tail. The *muscular system* is highly developed. The *alimentary apparatus* consists of a mouth, œsophagus, stomach, intestine, rectum, and anal cleft. For a minute description of these and of the sexual organisation, my limits oblige me to refer the reader to the works of the authors just named, who ascertained that the males of the oxyuris vermicularis are much more numerous than was formerly supposed.

124. *b. The locality* of these worms in the human body is the lower portion of the intestinal canal, especially the rectum. They occasionally stray upwards, but rarely higher than the lower part of the small intestine. They wander, however, out of the anus and into the vagina of females. Although most frequent in boys and young persons, yet they are not uncommon at all more advanced ages, even in the most aged, in whom I have repeatedly found them the most tormenting. They are gregarious, forming balls in the large intestines, frequently along with other worms, especially the *Ascaris lumbricoides*. J. P. Frank found them in the intestines of an infant so young that the umbilical portion of the chord had not separated. They are, of all the *Helmintha*, the most frequent tormentors of every age and of every people; for they are not limited to particular parts of the world.

125. *c. Symptoms.* — These vary with the number of the worms and their position. A few hardly occasion any marked symptoms; but when numerous, in the lowest part of the rectum, they occasion extremely distressing itching and an irritating annoyance, difficult to be described, extending to adjoining parts. Certain articles of diet, as onions, carrots, fruits, &c., render the worms more restless and irritating during the whole day; but they are generally most annoying when the patient goes to bed. When the patient falls asleep, grinding of the teeth, excitement of the sexual organs, and restlessness are caused by them. The consequences of this local and constant irritation are, especially at, and subsequently to, the period of puberty, increased sexual irritation, masturbation, &c., in both sexes, and in the female sex most distressingly when the worms wander into the vagina, when they occasion not merely pruritus but also leucorrhœa, &c. The loss of rest and the irritation they produce, ultimately impair nutrition, give rise to pallor, anæmia, and loss of

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actionis), trilabiatum; œsophagus musculosus cylindricus aut claviformis et canali triquetro perforatus; ventriculus globosus cavitate triangulari; intestinum in feminis ante apicem caudæ acutæ, in maribus in centro caudæ apertum.

"Mares: *fere microscopici; plerumque spirales in fine posteriore obtusi; penis simplex, uncinatus.*

"Feminæ: *cauda acuta; vagina semper in parte vermis anteriore sita; uterus bilocularis cum ovariis 2. Ovula lævia, oblonga, non symmetrica, multo longiora quam latiora, omnino magna:* 0·064 *mill.* 0·136 *longa.*"

* "*Corpus album; cutis transverse striata, in margine utroque cum duplice ordine dentium acutiorum et obtusiorum, secundum Dujardini mensuras* 0·018–0·023 *mill., secundum meas in feminis* 0·024 – 0·030 *mill.*= 0·0108–0·014‴ *P.*=0·011–0·015‴ *V., in maribus autem* 0·008 *mill.*=0·0036‴ *P.*=0·0037‴ *V., inter se distantium; caput 2 appendicibus lateralibus, vesiculosis epidermidis duplicaturâ; os rotundum, antice margine trilabiatum et angustum; œsophagus carnosus, musculis longitudinalibus et transversis, canali triquetro; ventriculus strictura; œsophago sejunctus, globosus, cum cavitate interna triquetra, et valvularum apparatu; epithelio polyedrico cum nodulo pellucido sparsim instructus.*

"Mas: 2·05 *mill.*=0·90‴ *P.*=0·95‴ *V. ad* 2·3 *mill. ad* 3·37 *mill. longus (si caudam semper curvatam tanquam lineâ rectâ extensam mensus est); in capite una cum appendicibus* 0·094 *mill.* = 0·041‴ *P.*= 0·042‴ *V., sine appendicibus* 0·024 *mill.*=0·0108‴ *P.*=0·011‴ *V., medio in corpore* 0·123 *mill.*=0·054‴ *P.*=0·055‴ *V., in cauda* 0·023 *mill.*—0·0144‴ *P.*=0·0148‴ *V. latus. Œsophagus a* 0·024 *mill.*=0·0108‴ *P.*=0·011‴ *V. ad* 0·041 *mill.*= 0·0108‴ *P.*=0·011 *V. ad* 0·041 *mill.*=0·018‴ *P.*=0·0185‴ *V. latitudinis intumidus est, circiter* 0·311 *mill*=0·137‴ *P.* =0·141‴ *V. longus. Œsophagum sequitur brevis tubi intestinalis strictura* 0·008 *mill.* =0·0036‴ *P.*=0·0037‴ *V. longa, et* 0·016 *mill.*=0·0072‴ *P.*=0·0074‴ *V. lata. Postea sequitur ventriculus* 0·115 *mill.*=0·050‴ *P.*=0 052‴ *V. longus, et* 0·065 *mill.*=0·0288‴ *P.*=0·0296‴ *V. latus, cum valvularum apparatu cognito; tubus intestinalis paulo post ventriculum latitudinis* 0·057 *mill.*=0·025‴ *P* = 0·026‴ *V. est, ad anum vero* 0·008 *mill.*=0·0036‴ *P.*=0·0037‴ *V. Penis simplex,* 0·057 *mill.*=0·025‴ *P.*=0·026 *V. longus, ad basin* 0·008 *mill.*= 0·0036‴ *P.*=0·0037‴ *V., in apice vero semper ad hamuli instar recurvato, latitudinis (adultiorum* 0·003 *mill.*=0·001‴ *P. et V.). Funiculus spermaticus et testis simplex; spermatozoidia epitheliorum imaginem simulantia. Caudæ apex in foveam suctoriam mutabilis.*

"Femina: 7·84 *ex aliis ad* 10 *mill.*=3·48, *ex aliis ad* 4·337‴ *P.*=3·57, *ex aliis ad* 4·56‴ *V. longa; in capitis apice cum appendicibus* 0·196 *mill.*=0·087‴ *P.*=0·089‴ *V.; sine appendicibus* 0·065 *mill.*=0·029‴ *P.*=0·0298‴ *V.; in medio corpore* 0·49 *ad* 0·59 *mill.*=0·21–0·26‴ *P.* =0·22–0·27‴ *V.; extremitas caudalis acutissima. Longitudo caudæ* (i. e., *partis inter anum et apicem*) 1·798 *mill.*=0·797‴ *P*=0·819‴ *V.; latitudo caudæ ad anum ipsam* 0·26 *mill.*=0·116‴ *P.*=0·119‴ *V., inde diminuta. Œsophagus* 0·65 *mill.*=0·29‴ *P.*=0 298‴ *V. longus, in capitis apice* 0·065 *mill.*=0 029‴ *P.*=0·298‴ *V., in parte posteriore* 0·098 *mill.*=0·043‴ *P.*=0·044‴ *V. latus. Strictura tubi intestinalis pone œsophagum uti in maribus perbrevis et* 0·028 *mill. seu* 0·128‴ *P. et V. lata. Ventriculus* 0·172 *mill.*=0·0768‴ *P. et V. et longus et latus, interdum latitudine aliquid minor. Vagina ex Dujardini mensuris* 1·8 *mill. ex meis ad* 1·64 *mill.*=0 7‴ *pone caput sita; in vivis* 1·06–1·2 *mill.*=0·46–0·54‴ *longa et* 0·11 *mill.*=0·049‴ *lata; cum foramine latitudinis* 0·13 *mill.*=0·06‴, *longitudinis* 0·15 *mill.*=0·07‴; *uterus duplex, cujus ramus posterior* 2 0 *mill.*=0·9‴, *cujus anterior* 1·35 *mill.*=0·6‴ *longus; ramosum ovulis impletorum latitudo ad* 0·4 *mill.*=0·18‴ *et ultra ovulis expulsis,* 0·2 *mill.*=0·09‴; *ovarium duplex, in transitu uteri in anum* 0·03 *mill.*=0·015‴ *latum.*

"Ovula *fere oblonga non symmetrica; ex Dujardini mensuris* 0·055 *mill. lata et* 0·064 *mill. longa, ex meis media in parte ovulorum* 0.029 *mill.*=0·012‴ *P.*=0·013‴ *V., in apicibus circiter* 0·012 *mill.*=0·005‴ *P.*=0·006‴ *V. lata et* 0·05 *mill.*=0·022‴ *P. et V. longa. Embryones viventes in ovulis nondum vidi.*"—Küchenmeister.

flesh; irritation of the nostrils, sneezings, discoloration of the countenance, or a dark circle around the eyes, dilated pupils, and various sympathetic phenomena.

126. *d.* The *Diagnosis*, however, of these thread-worms can be established with certainty only by examining the fæcal evacuations, especially after the administration of an enema. The *prognosis*, although the complaint is unattended by danger, is not favourable as respects either a speedy or a permanent cure.

127. iii. STRONGYLI[*] *and their Allies.* — This genus of worms has been often described; but, of the less recent writers, more especially by RUDOLPHI and BREMSER. The *species* which most particularly interest the physician is —

128. *A. The Strongylus gigas.*[†] — *Ascaris visceralis aut renalis*, GMELIN; *Lumbrici in renibus*, BLASIUS; *L. renalis*, REDI; *Fusaria visceralis aut renalis*, ZEDER. KÜCHENMEISTER remarks that BREMSER has shown this worm, which occurs, although rarely in the abdominal cavity, the omentum, but especially in the kidneys and urinary bladder, more rarely in the lungs and liver, and only when strayed in the intestinal canal of martens, dogs, wolves, seals, otters, oxen, and horses, is still more rare in man; and that a number of those accounts of worms passing off through the urinary passages are delusions. Since a minute knowledge of the pathology of the kidneys has been acquired, it may be inferred that many of these cases would be recognised as fibrinous casts thrown off in the urine during disease of these organs. That these worms are extremely rare, even in the kidneys, must be admitted, since KÜCHENMEISTER has never met with a case in his own practice. He has, moreover, thrown rational doubts on the authenticity of most of the cases on record, showing that these cases, at least some of them, may have been instances of mistaken diagnosis. DR. LANKESTER, however, states that there is a fine specimen of this worm taken from a human kidney in the Museum of the Royal College of Surgeons of England.

129. *a.* When fresh, this worm has a reddish colour. In spirit this colour fades, and the worm assumes a greyish leaden hue. Four longitudinal stripes are observed on it. The total length of a female specimen was 19 Saxon inches. DUJARDIN states that the vagina opens 1 to 2 inches from the caudal extremity. DIESING says that the ganglial system of nerves is most manifest in this worm, a remark which is confirmed by BLANCHARD, OTTO, and VON SIEBOLD.

130. *b. The symptoms* of this worm are equivocal, for there can be no evidence of its existence to be relied upon, until it is discharged, thereby demonstrating its existence. Another species of *Strongylus*, the *S. longevaginatus* of DIESING, has been said to have been found in the human subject, but without sufficient proof.

131. iv. ANCYLOSTOMUM.[*] — *Anchylostoma*, DUBINI; *Ancylostoma*, CREPLIN.—This worm was found by DUBINI in Milan, in 1838, in the duodenum, and upper part of the jejunum; and subsequently also by PRUNER, BILHARZ, and GRIESINGER, in the countries watered by the Nile. According to VON SIEBOLD, it has never been found in Europe to the north of the Alps. DUBINI established this as a distinct *genus* from the *Strongyli*, by the symmetrical arrangement of the dental apparatus. We are, however, at present acquainted only with a single species of it.

132. *A. Ancylostomum duodenale.*[†] — BILHARZ, having had his attention called to this worm by VON SIEBOLD, in consequence of PRUNER having found it in Egypt, observed it in every body he examined after death in that country, sometimes in small numbers, sometimes in hundreds, less in the duodenum than in the jejunum, between the transverse folds of the mucous membrane. One male is found to three females. At the oval end, a large, obliquely truncated horny capsule, furnished with four strong teeth on the projecting portion of the upper margin, is seen. The oval orifice is turned to the surface opposite to the sexual and anal orifices. The animal attaches itself by its mouth so firmly to the mucous surface

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[*] "A. *Strongyli veri.* Corpore *subcylindrici, utrinque attenuato;* capite *nudo rarius alato*, 2 *appendicibus lateralibus armato;* ore *terminali, nudo vel sex papillis instructo, vel orbiculari; œsophago triangulari, musculoso;* cute *tenui.* Mas: *appendice multilobata aut radiata;* penis *simplex vel duplex, multilobatus, ad digitorum instar.* Femina: *caudâ obtusâ, rectâ;* ano *in parte caudali;* vaginâ *antrorsum sitâ;* utero *simplici aut biloculari;* ovulis *magnis* (0·06—0·12 *mill.*). *Animalia* ovi- *aut* vivipara."—KÜCHENMEISTER.

DUJARDIN arranges the *Strongyli veri* as the xivth Genus of his *Nematoides.* DIESING places the two species, *Str. gigas* and *Str. longivaginatus*, in his *Gen.* liv., *Eustrongylus*, thus defined by him: "*Corpore subcylindrico, utrinque sensim attenuato, capite corpore continuo, ore terminali, orbiculari, papilloso; bursa maris terminali, integra; pene filiformi longo, haud vaginato; vaginâ aut antrorsum aut retrorsum sitâ. Systemati gangliorum distinctissimo. Animalia ovi- aut vivipara, extra tubum intestinalem habitantia.*"

[†] "Corpore *rubro, cylindrico, longissimo, utrinque attenuato, striis aut annulis transversis interruptis et* 8 *fasciis fibrarum longitudinalium instructo; capite obtuso, truncato; ore orbiculari* 6 *papillis aut nodulis planiusculis, appropinquantibus; œsophago* 15—22 *mill. circiter longo, tenui et angustiore quam canalis intestinalis.*

"Mas: *corpore antrorsum magis attenuato*, 140 *ad* 140 *mill.*=10''—1' *longo*, 4—6 *mill. lato; caudâ obtusâ cum bursâ membranaceâ patelliformi, circa* 3 *mill. latâ, truncatâ; pene tenuissimo simplici.*

"Femina: *corpore utrinque attenuato*, 2 *decim. ad* 1 *metr.*=5''—3' *longo*, 5—12 *mill. lato; caudâ magis rectâ, obtuso-rotundatâ; ano triangulari, oblongo, sub extremitate caudali sito; vaginâ antrorsum sitâ; utero simplici; ovulis fere globulosis.*"—KÜCHENMEISTER.

[*] "*Vermes subcinerei, vivipari, corpus cylindricum; caput aliquid attenuatum; pharynx infundibuliformis, colore subfusco, parietibus resistentibus. Os acetabuliforme, subcorneum; apertura oris ampla circularis subdorsalis; dentes in fundo oris intra aperturæ marginem abdominalem* 4, *uncinati (os in altitudine infundibuli* 4 *uncinis intus recurvatis munitum et in fundo cum eminentiis conicis, in tabularum explicatione 'unguli tegumentarii' nominatis, in uncinos versis, utrique generi communibus*, Dubini); *œsophagus carnosus, qui ad clavæ instar inter descendendum largitur; cutis transverse striata, unde* 2 *eminentiæ conicæ prominent, uno alteri opposita, inter sextam anteriorem partem longitudinis vermiculi totalis et inter reliquas posteriores vermiculi partes, quæ quinquies sextam longitudinis totalis partem exhibent; anus lateralis et aliquid ab extremitate caudali remota. Extremitas caudalis maris bursam terminalem integram subtus excisam multiradiatam exappendiculatam; penem duplicem longissimum exhibens; feminæ obtusa, aperturam genitalem retrorsum sitam præbens*,"—DIESING et DUBINI.

[†] "*Caput apice rotundatum; oris limbi papillis conicis inæqualibus, duabus minoribus, uncinis papillis impositis apicibus convergentibus. Corpus subrectum v. parum curvatum, anteriore parte transparens, ventriculo globoso nigrescente, posteriore flavido-fuscum, maris antrorsum attenuatum, extremitate caudali inflexâ; bursâ cyathiformi bilobâ* 11-*radiatâ, cujus radii ita sunt positi, ut triplicem eorum ordinem conspicere possis, in utroque enim latere ordinem quatuor, media in parte trium radiorum (radiis lateralibus utriusque* 5 *simplicibus:* Diesing); *radio dorsali apice furcato; feminæ extremitate posticâ acute conicâ. Longit. mar.* 3—4'''; *fem.* 4—5'''; *crassit. ad* ½'''."—DIESING et VON SIEBOLD.

that the mouth is torn away when it is detached by force. Its nourishment is blood, as proved by its intestine being filled with this fluid.

133. *a. Pathology.*—This worm is of great interest and importance, and is often fatal to those afflicted with it. GRIESINGER, the best chemical observer of this worm, states that this worm attaches itself firmly by biting into the mucous and submucous membranes; and that the spot on which a worm has been attached is indicated by an ecchymosis of the size of a lentil, in the centre of which, a white spot, the size of a pin's head, appears, which is pierced by a hole penetrating into the submucous tissue. From these wounds the blood enters freely into the intestine of the worm, which is filled with blood from the punctured places. Frequently the mucous membrane of the intestine is studded with flat, livid, brownish-red elevations of the size of a lentil. This is owing to the collection of the blood between the mucous membrane and muscular coat. In some cases a specimen of the worm is found lying in the cavity thus formed, covered with blood, with which it has completely engorged itself. The manifest consequence of this infliction is *anæmia*. GRIESINGER imputes the "*Egyptian chlorosis*," which he had previously described, and which, he avers, attacks one fourth of the population, entirely to the presence of this worm.

134. *b. Symptoms.*—At an *early period*, pallor of the face, general surface, lips and gums; palpitations of the heart, especially on any exertion, sounds in the jugular veins on auscultation, lassitude, debility without emaciation, are the chief phenomena. Subsequently disordered digestion, irregularity of the bowels, and *Catarrhus intestinalis* are complained of. These symptoms may continue an indefinite time; but if not removed by a decided treatment, the consequences are most serious and generally fatal. Emaciation often does not commence until late in the disease. Œdema of the extremities and eyelids; a pale yellowish or greenish yellow hue of the general surface; a withered, dry, flabby, and cold state of the integuments, and a remarkable pallor of the outlets of mucous canals; remarkable apathy, and sense of exhaustion; constant and distressing palpitations, the sounds of the heart being often heard at the distance of several feet; murmurs in all the larger arteries, and a rushing or purring sound in the jugulars, slowly supervene. The pulse is uncommonly quick and small; the respiratory movements are weak, frequent, and short; the urine is abundant, pale, and rarely contains albumen. Giddiness and headache are commonly experienced. Constant hunger, singular appetites, and slight febrile movements, sometimes with enlargement of the spleen and atrophy of the liver, are observed. With indulgence and full diet this state may last for years; but in very many cases the progress of the malady is rapid. Even in the best circumstances the patient is pallid, sickly, and miserable, exhibiting a high degree of anæmia and hydræmia. Various acute affections often supervene and complicate the disease, and a chronic diarrhœa or dysentery ultimately carries off the patient. Fatiguing labour, a lowering or antiphlogistic treatment, and debilitating agents hasten dissolution. A restorative regimen, change of climate, and judicious treatment, often arrest the complaint. All the phenomena consequent on the presence of these parasites are characteristic of a very slow but continued loss of blood, which, if not arrested, goes on until the quantity and the quality of this fluid are no longer sufficient to sustain life; *death* supervening with faintness, dyspnœa, and fatal syncope.

135. *c.* On *examination* after death, the organs and structures generally are wasted, pallid and softened. The spleen is often enlarged; the liver is pale and atrophied; the veins are nearly empty; the heart and large venous trunks contain only soft, small brown coagula, with very little fibrine. In many even of the large venous trunks there is only a dark serous-looking fluid, with a few pale, large, and colourless blood-globules. The substance of the heart, especially the inner layers of muscles, are very pale and even fatty. This organ is generally large, thick, hypertrophied or dilated, particularly on the left side. The endocardium and valves are often irregular, as if thickened in parts. The brain, the lungs, the muscles, the digestive mucous surface, &c., exhibit remarkable pallor and anæmia; the cellular tissue and muscles being softened, flabby, and in parts exhibiting a watery infiltration (§ 134.).

136. v. THE FILARIÆ.* — These form the seventh genus of the first class "*Nematodes*," of DUJARDIN, and the fortieth genus of the sixth order, "*Nematoidea*" of DIESING. From the *Gordii* they are distinguished by structure, mode of life, the nature of the youngest brood, and by the circumstance that they readily burst in water, like other *Nematoda*, which is not the case with the *Gordii* (DIESING).

137. *A. Filaria Medinensis.* † — PLUTARCH refers in the ninth question of the eighth book of his "*Symposiacon*," to the statement of AGATHARCHIDES of Cnidus, the geographer and philosopher, "That the people on the Arabian side of the Red Sea suffered many strange diseases; amongst others, worms, like little snakes (δρακόντια μικρά), came out upon them, which gnawed their legs and arms, and when touched retracted themselves, coiled themselves up in the flesh, and gave rise to the most insupportable pains; but that this evil

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* Diagnosis: "*Vermes albi, subfusci, aut rubri, corpore filiformi, elastico, cylindrico, ut plurimum longissimo; capite corpore continuo, inermi aut spinulis rectis et corneis (dentibus seu papillis prominentibus Autorum) armato; ore terminali non labiato, vel labiato rotundo, aut triangulari; œsophago brevi, tubuloso, rectiore quam intestinum; ano terminali aut ante caudæ apicem sito; cute lævi aut leviter oblique striata.*

"Mas: *caudâ plerumque obtusâ, interdum membranam accessoriam alosam exhibente; spiculis filiformibus in vagina tubulosa aut ligulæformi, ex* Dujardino *inæqualibus, curvatis (?).* Femina: *vagina antrorsum proxime ad os sita, plerumque duplici (Filaria rigida) aut multiplici (exc. quinqueloculari in Filaria labiata,* Nathusius); *ovulis ellipticis aut globosis, laccribus. Nunc* ovi- *nunc* viviparæ."

† "Mares *omnino ignoti aut potius ab auctoribus neglecti et omissi, quia ob minorem magnitudinem minores efficiunt et molestias et dolores et vix unquam majores tumores; sed uti* Diesingius *ipse enarrat, a* Clellandio *in* Calcutta Journ. of Nat. Hist. I. 359, Pl. X., *fig.* 1. *delineati.*

"Feminæ: *corpore longissimo (ad* 3 *ulnas et aliquid supra), subalbo, filiformi, subæquali, secundum* Dujardinum *antrorsum, sed secundum* Diesingium *et quidem quod ipse affirmare possum retrorsum, sensim attenuato, ad* 1‴ *seu ad* 1—2¼ *mill. lato; ore orbiculari, spinulis* 4 *cruciatim oppositis; caudâ ad apicem uncinatâ, subacutâ, in apice* 0·065—0·082 *mill.*=0·028—0·036‴ *Par.*= 0·029—0·037‴ *V. latâ, interdum in vermis ipsius cute ita affixâ, ut vix apicem liberum facere possis; vagina ovulis; embryonibus* 1″ *longis, vix* ⅛‴ *latis. Species* vivipara."—KÜCHENMEISTER.

has been found only then, and neither before nor since amongst any other people." Many authors, with much appearance of justice, believe that the fiery serpents, which Moses states to have been so destructive to the Israelites when journeying in the vicinity of the Red Sea, were *Filariæ Medinenses*, and consequently that Moses is the first writer to notice this worm, and that the fiery inflammation produced by it, gave rise to the appellation bestowed upon it by the Hebrew writer.* That the *Filaria* was considered a species of serpent by the ancients, is proved by the Greek name *δρακόντιον*, *dracunculus*, which was given it, and by the inflammation, pain, and swelling which occurred with the breaking out of the worm. The mortality amongst the Israelites may be explained by their ignorance of the proper treatment, and of the danger consequent upon the breaking of the worm. Avenzoar states that, in his country, "Æger in continenti post dolorem vehementem in parte affecta exortum moriatur." The distemper being endemic in the place where the Israelites were sojourning (in Arabia Petrea), in circumstances of great difficulty and even distress, and during the hygienic privations of encampments in a barren country, it is not surprising that it then and there assumed an epidemic and fatal character.

138. Synon. The *Filaria Medinensis* has received a variety of names, viz. the *Dracunculus*; the *Drac. tibiarum*; the *Drac. Persarum*; the *Guinea-worm* or *G. thread-worm*; from its frequent occurrence on the coast of Guinea; the *Guinea dragon*; the *Guinea hair-worm*; *Pharaoh's worm*; the *Skin-worm*; the *leg-worm*; *le Dragonneau*, *le ver de Guinée*, *le ver Cutané*, by the French; *Guinischer Fadenwurm*; *Guinische Drache*, *Pharaohswurm*, by the Germans.

139. *a.* Our knowledge of the natural history of this worm, and of the early stages of its development, is very deficient. Küchenmeister states that it is of the thickness of packthread, its anterior extremity obtuse, the mouth circular, without lips, but beset with four hooks, or more correctly with four styles, or acute straight spines; the vagina opens in the vicinity of the mouth, and the vagina and uterus are probably double, as in most Filaria. The length of the worm varies from several inches to three yards. Statements of greater dimensions are probably founded in error. The whole surface of the worm and its tail exhibit the well-known fine rings, placed at an uniform distance. The substance of the body is homogeneous, finely granulated, and exhibits no traces of muscular fibres. Its œsophagus, intestinal canal, uterus, &c., require no description.*

140. *b.* The worm is indigenous only in the hot zone, and, even when transported into colder climates, does not appear to propagate itself. Even in the hot zone it does not occur everywhere, but only in particular countries, like all the *Helmintha*, and is entirely in certain places in affected countries, as, for instance, in the Gambia, Angola, Canlabah, &c. The places in which the *Filaria Medinensis* more particularly occurs, are Senegal and the coast of Guinea, the East Indies, Persia, Arabia Petrea, the coasts of the Red Sea, especially towards the south, the shores of the Ganges, Bombay, the Caspian Sea, Upper Egypt, Abyssinia, Nubia. It was introduced into America by Negro slaves, especially into Surinam. Throughout the countries now mentioned it attacks aborigines and foreigners without distinction. According to Pruner the worm often becomes epidemic, in wet seasons and in marshy districts. Bremser states that it is most frequently seen in the East Indies from November to January (the rainy season); and in Upper Egypt, according to Bilharz, shortly after the inundations of the Nile.

141. *c.* The mode of production of the worm is still enveloped in obscurity. English officers, who never went about with the feet and arms uncovered, remained free from this worm. Pruner thinks that the germ of the worm is an independent marsh animal, which is converted into a Dracunculus within the human body. Forbes believes that he found the brood of the Dracunculus free in the red, ochrey mud of the drying marshes. However, the aborigines think that it comes from the marshy grounds into the skin. The ordinary seat of the worm is the sub-cutaneous cellular tissue, especially of the lower extremities, around the ankle. It may, however, occur under the skin and muscles in all other parts of the human body. Instances of its occurrence in other parts of the body besides the extremities are recorded by Kämpfer, Bajon, Baillie, Peré, and have been seen by myself in Africa. M'Gregor, in 172 cases, states that it occurred 124 times in the feet, 33 times in the lower, 11 times in the upper part of the thigh, twice in the scrotum, and twice in the hands. Pruner found a specimen behind the liver, between the layers of the mesentery. Sometimes the worm lies coiled up in a small space, sometimes it is extended; and in the latter case, if it lies on the surface, it feels as a varicose vein. Peré saw it lying in a snake-like form under the whole of the skin of the abdomen and

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* Upon referring to a translation of the Bible from the Hebrew into Latin, with very copious annotations, by Immanuel Tremelli and Francis Junius (the former a learned Rabbi converted to Christianity, the first and second editions of which, published in London in 1579—80, and 1584 in quarto, are in my library), I find that he translates the Hebrew description as follows: — "Tum immisit Jehova in populum illum serpentes presteres, qui morderunt populum: ita moriabatur populus multus ex Israele." Here Tremelli translates the Hebrew into venomous serpents; but in a note he states, that according to the original they were fiery serpents. To this translation of the Bible and to its copious annotations, the translators of King James's Bible, and modern annotators, are more indebted than has been made to appear. Upon referring further to the very rare edition of the Vulgate, also in my possession, which was printed in 1481, and known by the term "*Fontibus ex Græcis*," &c., the serpents are called "fiery serpents — (Misit Deus ignitos serpentes) — which inflicted wounds and death on many." This edition of the Bible is in folio, on a thick, beautiful paper, the ink being a bright jet-black, without the name of either printer or publisher, and without the verses being numbered, but with the initial letters illuminated and coloured. These translations vary only in the term "venomous" being used by the former for "fiery;" whilst the statement in the latter, that these serpents "inflicted wounds and death on many," may be considered as nearer the truth, as the infliction of wounds does not imply that death was always the result. Some translations, which retain the appellation "fiery," very justly explain it by stating it to refer entirely to the inflammation and pain produced by these animals.

* Bremser gives the following systematic description of this worm: "Longissima cylindrata, elastica, ferè equaliter crassa, capite attenuata, ore minimo, circulari, cauda maris medium sui finis ad locum, quintali spirali, prominente, sublata, inflexa; feminæ semitereti, acutiuscula, incurva prædita; in hominis tela cellulosa subcutanea, præsertim pedum; in regionibus tropicis figi solita."

a part of that of the chest, and similar cases of its extension are on record. "These examples will suffice to give a clear idea of this worm, of which, moreover, as many as twenty-eight, thirty, nay even fifty specimens have been observed in one man" (Küchenmeister).

142. *d. Diagnosis.* — If the worm is superficial, with a hard substratum, its growth is seen to take place with extraordinary rapidity, from 4‴ it becomes several inches long in a couple of days. It is then easily killed by poultices of boiled garlic, after which it is absorbed without injurious consequences. Frequently the worm occasions little or no annoyance for a long time. Dampier and Isert had quitted the district of these worms for 6—8 months, and Wendler's patient for 4—6 months before the worm betrayed itself. According to Kämpfer and others, this latent state may continue 12—15 months, and in rare cases, even until the third year. In other instances, emaciation, notwithstanding a good appetite and absence of fever, takes place, terminating at last in fatal exhaustion. When the worm is making its way out, a small pustule appears at the point where it will break through, sometimes with, and sometimes without, preliminary annoyance, or headache, pain in the stomach, nausea, fever, &c. At the point where it breaks through, inflammation, swelling, and suppuration occur several days previously, and continue until the worm is extracted. If it lies over or near to a joint, the use of the limb is prevented, and the symptoms are still more severe. In the case of Drummond, after pain and stiffness of the leg, a reddish swelling, with a black point in the centre, was formed above the inside of the ankle; and at the same time he felt a firm, round, catgut-like substance twisted under the integuments. About three weeks after the first sensation of stiffness, he was seized with a sudden insupportable itching over the whole body, with fever, violent colic, vomiting, and purging; after which, shiverings without perspiration followed. In the mean time the swelling had burst, and a hard white substance appeared, but so deep that it could not be laid hold of, the animal having buried itself deeper amongst the muscles. The cat-gut-like twisted substance formerly felt was not now present. In the following night the ankle and vicinity were much inflamed; and three days afterwards a thread was passed round the animal, and a bloody ichorous discharge continued for six or seven weeks from the wound, which healed up gradually to a small point, when the worm again came forth, and was fastened with a thread, rolled upon a stick, and drawn out twice a day. In twenty days the extraction was completed. Two or three days after the formation of vesicles on the inflamed part these open up, or are opened by a lancet, when matter, blood, and sanies, and two or three inches of the anterior end of the worm came forth. If this end be carefully pulled several inches, more often follow. All this is coiled around a little roll of linen, or a small stick, and fastened over the wound with a compress and adhesive plaster; and the worm is thus wound out by repeated, careful operations, twice daily. The worm rarely comes away on the first attempt, several days, or even weeks, being required before this is accomplished. Mr. Busk, in the *Transactions of the Microscopical Society*, has given one of the best descriptions of this worm.

143. vi. **Ascarides.** — These worms are arranged by Dujardin as the nineteenth genus of the *Nematoda*; and by Diesing as the twentieth genus of the sixth order of the *Achæthelmintha elastica*, but the *Oxyuri* are also introduced by him into this genus. The classification of Diesing is so involved that more confusion than elucidation is the result. Refining, hair-splitting, and drawing distinctions, which are either observed with difficulty, or not at all, are not the least faults of some modern observers. I subjoin Dujardin's systematic description of this genus.* The only *species* to be here noticed is the —

144. *A. Ascaris lumbricoides.* — Synon.: *Ascaris gymnoascaridæ*, Diesing; *Ascaris lumbricoides*, Linnæus; *A. gigas*, Goeze; *Lumbricus teres*, Auct; *Fusaria lumbricoides*, Zeder; but the Linnæan name is very generally retained.†

145. *a. Description.* — The head of the worm is distinctly composed of three papillæ, which can undoubtedly be spread out upon the intestine, in a broad, circular, sucker-like surface, in the sucking act of the worm. Bremser has seen the opening and closing of these papillæ, and described the mechanism. He even reports that at the moment of opening he saw a little tube protrude from the centre, which is the true oral orifice. Wedl thinks that this is the cleft proboscis, which is everted from the oral aperture for the reception of nourishment. The true oral aperture is, however, formed by the opened lips or papillæ; the

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* "Ascarides: *corpore albo aut subflavo, subcylindrico, utrinque attenuato, fusiformi, 4 striis longitudinalibus subalbis, opacis, linearibus, instructo; cute transverse striatâ; capite tubus, valvulis (labiis) convexis aut semilunaribus, interne fenestratis; œsophago valde musculoso, cylindrico aut clavæformi; ventriculo cavitatem triangularem præbente.*

"Mas *minor quam femina; extremitate caudali aliquid curvatâ et involutâ, nunc nudâ, nunc membranâ alatâ duplici, aut duplici tuberculorum et papillarum ordine aut rarissime acetabulo instructâ caudâ breviore, obtusiore, quam in feminis; spiculo aut pene duplice plus minusve longo et arcuato.*

"Femina *caudâ rectiore et longiore; vaginâ simplici antrorsum sitâ; utero bi-aut multiloculari; ovariis filiformibus, longissimis, duplicibus aut multiplicibus; ovula elliptica aut globulosa, extus lævia. Species aut* ovi- *aut* viviparæ, *plerumque in tubo intestinali viventes.*"

† "*Vermes albi aut rubro-pallidi, cylindrici, in extremitatibus attenuati, fusiformes elastici; cute transverse subarticulata striis transversis* 0·02 *mill. inter se distantibus, ex duobus stratis composita,* 4 *lineis lateralibus longitudinalibus subalbis majoribus, capite distincto, parvo* (0·7 *mill. lato*), *tribus valvulis semilunaribus, prominentibus, ad margines hyalinis armato, interne denticulatum musculorum stratum ad galli jubæ modum præbente; œsophago musculoso,* 6—8 *mill. longo, filiformi, triquetro, ventriculo clavæformi* (0·7 *mill. lato,* 2—3 *mill. longo*) *parvulo, intestino simplici valvulis aut villis et epithelio polyedrico sparsim instructo.*

"Mas: 150 *ad* 170 *mill.*=4 *ad* 6‴ *long.*, 3·2 *mill. lat., cauda aliquid depressa, conica, inflexa et curvata, spiculis* 2 *planis, subensiformibus, fere rectis,* 1·8 *mill. ad* 2·12 *mill. longis,* 0·18 *ad* 0·23 *mill. latis. Organo spermatico simplici,* 1200 *mill. longo, testiculo cæco perparvo, retortiformi, funiculo spermatico albo-intumido, ductu ejaculatorio angustiore ad ani latus sese aperienti. Spermatozoidia globuliformia, granulosa, in feminæ vagina maturescentia.*

"Femina: 200 *ad* 275 *mill. et supra longa*=8 *ad* 18″; *media in parte* 4 *ad* 5·5 *mill. lata; caudâ conicâ obtusâ; aut aliquid ante caudæ apicem sito* (1 *mill. circiter*); *vaginâ simplici ante corporis dimidium sitâ, ex magnitudine feminarum variabili* (*ex c.* 85 *mill. pone caput in femina* 245 *mill. et* 103 *mill. in femina* 214 *mill. longa*); *utero ab initio simplici, bipartita aut biloculari. Ovaria filiformia, sensim attenuata, retrorsum usque ad anum, et antrorsum supra vaginam aliquantulum pergentia. Totalis utriusque ovarii longitudo ad* 44′ *Lips.*

"Ovula *immatura subtriquetra, numero* 4 *ad* 8 *conglomerata, matura isolata, rotunda, ad* 0·087 *mill. lata, cum testâ tenui, lævi; in natura libera sensim embryones evolventia.*"—Küchenmeister.

small tubule in the centre represents the *introitus faucium*. Its protrusion is probably as much by its own muscular structure as by the contraction of the general muscular structure of the body. The males and females may be distinguished by their form and external appearance. The abdomen of the female is slender, and fusiformly pointed. The male is bent like a hook, and sometimes presents, a short distance from the tail, a pair of white, delicate, projecting hairs, which are the protruded penis. If the female be pressed, or allowed to swell in water, a prolapsus of these tubes (ovaries), and a discharge of a milky substance (eggs), takes place in the anterior half of the animal from the vaginal orifice. If the male be pressed, a milky juice (seminal globules) flows out in the vicinity of the anus, without the occurrence of a prolapsus. The intestinal canal is whitish and muscular at its commencement; the œsophagus is composed of thick layers of longitudinal and transverse fibres, and passes rapidly, and without any marked constriction, into the intestinal canal, the parietes of which are thin, internally covered with epithelium, and shines through, of a brownish colour, from the brown excrement. This intestine has a muscular coat, which is connected with the cutaneous longitudinal and circular muscles. The external integument consists of six layers. Under the outer layer are two layers of fibres crossing each other obliquely, and two laid at a right angle over each other, and between the former and latter two a sixth homogeneous layer, which appears to contain a peculiar odorous fluid, of an oily and reddish appearance, and exhibits refractive phenomena (KÜCHENMEISTER).

146. *b. Symptoms.*—Very generally the host and his guests, the *Ascarides*, agree very well together, until, owing to causes affecting these animals, or the digestive organs of their host, a disagreement between them takes place, and various disorders or symptoms ensue. When these worms are few in number, notwithstanding their size, they often occasion but little disorder, and live amicably with their entertainer on unelaborated chyme, until their numbers, changes of diet, and other occurrences produce more or less ailment. In most cases, when their numbers are not great, a good, or a too good appetite, is the chief injury they do; and in this respect they are much less noxious than the much smaller *Ancylostoma*. Great numbers of these worms in the intestines, and a firm aggregation of them into coils and knots, sometimes with the small thread-worms intervening, often occasion much disorder, according to the mechanical obstacle and the irritation they may produce. Colic, ileus, constipation, diarrhœa, flatulency, congestions of the brain, especially in children, and various reflex phenomena manifested in distant parts, and on voluntary muscles both of the trunk and of the lower extremities, are then not unfrequent occurrences. Besides the influence of inordinate numbers—of 200—350 — knotted into balls, which I have expelled from the bowels of both children and adults, the irritation and the consequent effects produced by even small or moderate numbers are often serious; for, owing to states of the digestive organs of their host, to the influence of certain kinds of food, or of change of diet upon them, or to the agitation arising in them from the influence of season, and to the periodical seeking of the females by the males, much disturbance may ensue, or the worms may travel or stray into parts of the digestive canal not usually visited by them, and thus induce very serious effects; which may even terminate in death. These effects, however, will depend much upon the irritability and other circumstances of the patient, the number of the wanderers, and the parts which they have reached. When irritations of the intestinal canal occur, and produce watery diarrhœa, cholera, &c., these worms are thereby affected; they swell up, lose their powers of adhesion, and are often carried away *per anum*. But one or more worms may pass unusually high in the intestines, may rise through the pylorus into the stomach, and occasion retching, vomitings, &c., irritation in the œsophagus, fever, delirium, and upon the discharge of the worm all rapidly disappear. But before rising so high in the digestive canal, one or more may pass into the common duct, or even into the cystic, or the hepatic, or the pancreatic ducts, and produce symptoms similar, or approaching to gall-stones, or inflammation, spasm, and disease of these ducts. These latter occurrences are, however, very rare; for generally the secretions passing along these ducts into the duodenum are not much relished by these worms, and these routes are not pursued by them. When the worm passes into the stomach, it may rapidly rise into the upper part of the œsophagus, or into the pharynx, and even get entangled in the larynx and produce the most distressing effects. But such occurrences, although observed, are very rare. After long periods of abstinence or inanition they have been found to migrate and escape from the anus, mouth, and nose; and such migrations are not uncommon in the course of continued and remittent fevers.

147. The *symptoms* produced by Ascarides, whilst they continue in the intestine, are mechanical, direct, and reflex. The former are the phenomena of the usual catarrhal affections of the stomach and intestines (gastro-intestinal irritations) in every grade; costiveness, tormina, colic; a sense of weight, of irritation, or of a ball, or gnawing and itching near the umbilicus; disordered, craving, and irregular appetite, and digestion, &c. The latter are hiccup, subsultus of the abdominal muscles, cramps of the lower extremities, yawning, increased secretion of saliva, snuffling or tickling of the nose, but rare of the anus, unless upon the passage of a worm.

148. The question has been often entertained as to the possibility of these worms perforating the parietes of the healthy intestines, and making their way into places more or less distant from their usual residence. That these worms can *never perforate the healthy intestine; the structure of its head, and its thin lips being adapted only for suction and not for boring*, is the opinion of RUDOLPHI, BREMSER, ROKITANSKY, BEMDERGER, J. P. FRANK, KÜCHENMEISTER, and myself, in opposition to that of VON SIEBOLD and MONDIÈRE. Therefore it may be concluded that when these worms are found in situations external to the digestive canal, they have reached it by some pre-existing ulceration, perforation, or fistula.

149. Many, especially of the older authors, have attributed a prognostic and generally an unfavourable import to the discharge of worms during febrile diseases, and more especially during typhoid

fevers; and this opinion is not limited to the Ascarides, but is extended to the flat worms, and they have argued that the worms in these circumstances are like the rats, and have the prescience of deserting a sinking ship! But as the discharge of worms from a fever-patient does not occur until after the seventh day, according to ZIMMERMANN, it is much more probable that they travel from the intestines, owing to the food obtained by them being insufficient or not suited to them, and to the secretions of the intestines being injurious to them, and in search of more abundant or more suitable aliment. The ulcerations of the intestines and the morbid matter from these ulcers in the advanced stages of continued fevers, will also tend to expel or to occasion a discharge of these worms, which, when observed, may be justly viewed, both as an indication of the existence of these lesions, and of the extreme danger of the malady.

150. vi. A GENERAL VIEW OF THE SYMPTOMS PRODUCED BY WORMS IN THE DIGESTIVE CANAL.—Most of the symptoms produced by worms may arise from other causes; but a careful recognition and observation of these symptoms, of their successions, grouping, &c., are requisite for the due regulation of the treatment, and for the ascertaining of the species of worm which is present. The symptoms produced most commonly by the individual species of worm have been noticed with reference to each; but recent writers have been more intent upon the microscopic descriptions of these parasites, and upon drawing minute distinctions, &c., than upon more useful and practical considerations connected with them. It is justly argued that the discharge of the more common species of worms infesting the intestinal canal is the only true *diagnosis* of verminous diseases; but this discharge, even in the most serious cases, may not occur without means being used to effect it; and it is by a knowledge of these symptoms, independently of such discharge, that we are led to administer the means most likely both to establish this diagnosis and to effect a cure.

151. *A.* The more *direct and local symptoms*, or those more immediately caused by worms are—a capricious and variable appetite—at one time, a craving and insatiable hunger or an unsated desire of food; at other times, nausea, or cardialgia, borborygmi, loathing, retching, or vomiting, being present; a sense of weight in the abdomen, with distension, gnawing, or erosion; a feeling of cold internally, or of emptiness or inanition, often with palpitations, or leipothymia, or faintness; a dragging, twisting, or lancinating pain in the abdominal regions, especially near the umbilicus, or tormina, spasms, colicky attacks, tenesmus, constipation, or irregularities of the intestinal functions; leucorrhœa, and itching, or a mucous or watery exudation from the anus, sometimes a mucous diarrhœa, tenesmus, and bearing down pains in adult females, or derangements of the catamenia, or even abortion; and in children, more especially tormina, colic, constipation, and intus-susception of the bowels, with various cerebral symptoms about to be noticed. In both sexes "manustupratio" is not infrequent, even at an early age.

152. *B.* The *symptoms* caused in more distant parts by sympathy with the seat of irritation, or by direct and reflex sympathy, are chiefly a frequent, dry, and tickling cough; hiccup, anxiety at the præcordia, or pungent pains passing under the false-ribs and at the epigastrium; a sense of something in the œsophagus, sometimes with tickling in the pharynx; partial amaurosis and dilatation of the pupils; sneezings, itching and dryness of the nose and nostrils, sometimes epistaxis, itching of the skin, without eruption; grinding or grating of the teeth, and sudden startings when asleep; subsultus and spasms of the abdominal muscles; partial or general convulsive movements without complete loss of consciousness; chorea or twitchings, or irregular contractions of particular muscles, especially those of the face and lower extremities; and more or less fully developed, general, or epileptic convulsions. The urinary excretion is sometimes disordered, and dysuria or frequent micturition complained of, the urine being whey-coloured, turbid, &c., with, or without a sediment.

153. *C. A general Verminous Cachexia* is not infrequently present, manifested by a pale, tumid, or livid state of the features; by a sunken appearance of the eyes and a leaden hue beneath them; a general pallor, and more or less anæmia of the surface of the body, lips, &c.; a perverted state of the sense of smell, or the entire loss of smell; a strawberry hue of the tongue, or mucous sordes on the tongue, and about the teeth and gums, stridor of the teeth, and a peculiar fœtor of the breath, sometimes a more or less evident affection of the voice and speech; a morose, irritable state of temper, vertigo, frightful dreams, timidity, somnolency; slight or low delirium, risus sardonicus, and prostration of strength. The biliary secretion is sometimes scanty, and in some cases even jaundice is observed. The abdominal secretions are very often disordered, and the functions of excretion generally impeded. These and other effects—local and sympathetic—are manifestly produced—1st, by the irritation of the digestive mucous surface, which may, in the cases of certain worms, and in susceptible constitutions especially, go on to inflammation and its consequences; and, 2nd, by the changes these animals produce in the chyme and chyle derived from the ordinary food, and upon the secretions of the gastro-intestinal surface, and upon those of the liver and pancreas. The former of these effects, namely, those consisting of gastro-intestinal irritation and its consequences, will also contribute to the production of the latter; but it cannot be doubted that much of the nourishment which should be taken up by the intestinal surface is intercepted by these parasites, whilst a portion of the fluids, lacteal or serous, are removed from this surface by the suction exerted by these animals.

154. All the symptoms now enumerated are not observed in the same case, but many of them either co-exist or appear in succession, and are variously grouped in different subjects, so as to render a diagnosis very difficult between this and other complaints. When the cachexia, debility, and sympathetic disturbance of the brain and its functions are considerable, more especially when the circulating fluids are diminished in quantity from deficient aliment, or impaired in quality by imperfect assimilation and depuration, the symptoms may assume a febrile character, sometimes mistaken for a form either of low fever, or of gastric fever; but more correctly recognised by some of the older writers by the term worm- or verminous fever. (See also § 73.)

155. vii. THE CAUSES OF WORMS may be inferred from what has been stated above; yet it may be of use to notice some particulars too generally overlooked by the recent writers, who have insisted upon the propagation of worms by means of ova, &c., and who may be considered as having disproved the doctrine of equivocal generation — or more correctly of spontaneous formation. A knowledge of the *predisposing causes* furnishes important indications in both the prevention and the treatment of verminous diseases; for, although the obsolete doctrine of spontaneous formation rendered this knowledge of the greatest interest, inasmuch as it was founded upon antecedent changes in the constitution, yet these changes are by no means devoid of influence in favouring the developement of the ova and embryos of parasitic animals. There can be no doubt, that children of weak, aged, and vitally exhausted parents; the female sex, debilitated males; and persons of all ages, who have been insufficiently or improperly fed in early life, or of a relaxed fibre or asthenic diathesis, are much more subject to worms, than those who are otherwise circumstanced. A tender and delicate state of health in early life; the use of crude, viscous, gelatinous, and vegetable food; whatever tends to lower the organic nervous force and vital resistance; a relaxed and asthenic habit of body; hereditary conformation; a residence in crowded and insufficiently drained cities and towns, or in cold and moist situations, especially in those which are abundantly covered with vegetable productions peculiar to the country, and a scanty use of such condiments, as salt and hot spices, as the climate may require, predispose to the generation of worms. In places where salt cannot be obtained in quantities requisite to the wants of the œconomy, as in some intertropical countries, the hot spices are used in its place by the natives. Those who contend, and, from recent researches, with manifest truth, that the presence of ova is necessary to the generation of human parasites, consider that the predisposition produced by these causes favour this generation, and that robust health and a sound constitution are subversive of their developement. Those who argue for their spontaneous formation believe that these causes not merely predispose to this formation, but also directly produce it; and that, owing to a weak and imperfect chylification and assimilation, or to a metamorphosis of the secretions, a material is evolved, which, under the favourable circumstances in which it is placed, and owing to a vital emanation from the body in which it lodged, assumes an organised and separate existence. These doctrines, however opposite — the former assuming, as predisposing causes, merely what the latter contends to be direct and exciting, or efficient, causes — agree in that, which is of the greatest importance to the physician: they both point out the best indications for preventing the continued, or the future, generation of worms, where they already exist or have existed, and for guarding against their invasion in circumstances which render such invasion more or less probable.

156. IV. TREATMENT OF WORMS. — The treatment of worms should have reference — 1st, To their *prophylaxis*, or prevention; — 2d, To their *expulsion*; — and 3d, To the *prevention of their recurrence*.

157. i. PROPHYLAXIS. — *A.* As to the *first of these intentions*, it must be admitted, that the accomplishment of it is always difficult, and often impossible. Our knowledge also of the modes and channels by which these parasites are conveyed into, and propagated by, the lower animals and human subjects, is imperfect. Admitting that they originate in ova which experience the changes in the processes of their developement above described, we still find it difficult to account for the presence of these ova, and for their passage into the human stomach. That the ova, as stated above, may attach themselves to raw vegetables and fruit, is not improbable. The feeding of domestic animals also upon the garbage or viscera of fish, fowls, or the mammalia, certainly favours the production of worms, especially those of the cistoid order, in these animals; and the ova from these, where perfect cleanliness in all respects is not observed, may be conveyed in the food or drink, or by the hands, especially unclean hands, into the human body. The amount of knowledge as to this topic appears to be limited to the observance of perfect cleanliness in all its bearings, including the utmost care as to the purity of the water used, and as to the use of raw vegetables and fruits. Marsh, stagnant, and even river water ought not to be used; or if the latter be taken, it ought to be previously boiled or filtered. Vegetables and fruits should be carefully washed, especially fallen fruit, if eaten in a raw state; and the domestic animals ought to be confined to their proper places, and neither petted nor fondled. The diet is also of some consequence; and no kind of animal food should be taken, unless it be sufficiently cooked. The raw flesh of animals, especially of pigs, and imperfectly cooked viscera of animals, and all unnatural modes of living, and neglect of the strictest attention to cleanliness in respect of diet and modes of living, should be most carefully avoided.

158. *B.* But it is not only the *prevention of the ingestion of ova* into the human body that should be studied, but also the *means of rendering these ova inert, or rather of preventing their developement* in the digestive canal. As with the former, so with the latter means of prevention, our knowledge is very imperfect. We may, however, infer, that those *predisposing causes* of worms, enumerated above, should, as much as possible, be removed or counteracted. Without a due attention to the removal of the predisposition, which favours the generation and developement of the entozoa, the treatment of verminous diseases will prove inefficient as regards the issue, and empirical in practice, especially when viewed in relation to the scientific application of the resources which the progress of knowledge and the discoveries of our contemporaries have placed within our reach. In furtherance of this indication, the diet and the treatment should be adopted that are most efficacious in promoting the organic nervous force, and the tone of the digestive organs, and in removing tenacious mucus and pituitous sordes, which often adhere to the digestive mucous surface, especially in asthenic, leucophlegmatic, and debilitated subjects, and which often form the nidus in which the ova of parasites are lodged and hatched. It will generally be noticed that the secretions and excretions, which, in all persons, form the principal part of the fæcal discharge, are seldom thrown off from the secreting surfaces so quickly and en-

tirely in the delicate and debilitated as in the robust and healthy; but remain, or are retained, in the former class of subjects, and become the soil in which these animals are reared.

159. *C.* Persons who are, or who have been, subject to verminous diseases, ought to adopt that kind of food, and to have recourse to those medicines, which their feelings and observation indicate as being calculated to distress, injure, and ultimately to destroy or eject intestinal worms. A due attention to such means is required not only for the expulsion, but also for preventing the future generation of these parasites. Another object, and one, indeed, which is the basis of the prevention and of the treatment of worms, is to determine, in as accurate a manner as possible, from the character of the symptoms, and from the examination of the fæces, the *species* of the animal which is to be dislodged. While, however, this diagnosis receives its due attention, care must be taken not to mistake other diseases, which possess many of the same features, for those proceeding from the presence of worms. This error is likely to occur frequently, since the one class of disorders often reciprocally bear the relation of cause and effect to each other. Nor, in many cases, will it be attended by any serious consequences, farther than from wanting appropriate direction, the treatment must be inefficient, and redundant and superfluous. It should also be kept in recollection, that worms are more apt to be generated during fevers, and during convalescence from fevers, especially such as are epidemic, adynamic or nervous, or are gastric or exanthematous, than in robust health, or even in other circumstances. The generation of parasitical animals in these maladies is not confined to the surface of the intestinal canal only. It is not unusual to observe the parasites, usually produced, in favourable circumstances, on the external surface of the body, become remarkably abundant during and after these fevers, especially when the diseased secretions are allowed to accumulate from a neglect of ablutions and of frequent change of linen. The appearance of animal parasites on these occasions was explained by the supporters of spontaneous formation, in the way above noticed (§§ 6, *et seq.*); whilst it was viewed, by the believers in generation from ova, as the result of a more favourable occasion being furnished for the developement of the ova during these diseases.

160. One of the earliest methods of preventing and of curing verminous diseases, resorted to by many physicians, is to remove, or attempt to remove, by purgatives or drastic means, the tenacious mucus adhering to the digestive mucous surface, and which, as they believe, forms the nidus or lodgement of worms; and they believe that the quantities of mucus dislodged from the bowels during and for some time after the exhibition of vermifuge, and other purgatives, are proofs of the accumulation of this mucus on the intestinal surface. That this mucus or sordes may be excessive, in many cases, may be admitted; but it may also be allowed, that the greater portion of this mucus is produced, by the irritation of the intestinal mucous membrane, by these purgatives. This method of prevention and treatment, when moderately and appropriately prescribed, may be of service in many cases; but it should not be overlooked, that the rough operation of these medicines often leaves a debilitated state of the intestines after their operation, which disposes them to generate, and prevents them from throwing off the mucous sordes and worms which these medicines were employed to remove. They cannot, by any mechanical property, or by any chemical or other influence on the intestinal secretions and excretions, always remove them from the extended surface covered by them in the manner, or so completely as, contemplated; and, even when the proposed end is completely attained, the intestinal functions are left in a more favourable condition than before, to reproduce both mucous sordes and worms, especially if any of the ova still remain unexpelled. Therefore, instead of trusting to the medicines usually employed as anthelmintics, vermifuge purgatives, alterants, &c., our attention ought to be directed (in some cases, instead of these medicines, in others, in addition to them, and subsequently to the use of them) to the adoption of remedies which promote the organic nervous forces, and the digestive and vital energies in general, thereby increasing the healthy and vigorous discharge of the various functions, and the due evolution and evacuation of the secretions and excretions from the digestive organs. (*See also the treatment after the expulsion of worms.*)

161. ii. Direct and Curative Treatment.— J. P. Frank, whose experience of the treatment of worms, when he wrote on the subject, had extended to half a century, considered that drastic purgatives and anthelmintics, at the commencement of the treatment, were seldom so serviceable, especially against tænia, as more gentle measures, which, in his opinion, should be first adopted, and be followed by more energetic remedies. But the diversity not only of these medicines, and of the combinations and methods of prescribing them, bewilder the inexperienced, until repeated opportunities of observation enable him to select those means and combinations upon which confidence can be placed. Küchenmeister justly remarks, that, if the multitude of remedies recommended for any disease is an evidence of their want of power against it, the therapeutics of worms are extremely defective. In truth, the treatment of these parasites leaves much to be desired as respects the efficacy of the medicines prescribed for them, the pleasantness of the most efficacious amongst them, and the disagreeable effects which often accompany and follow those most to be relied upon.

162. *A.* The Treatment of Tape-worm will *firstly*, and more especially, occupy attention, as it will comprise the most efficacious medicines and methods which have been employed, not only for these worms, but also for many of the others which have been noticed above; and when the treatment of these latter comes under consideration, then a brief reference to what has already been stated will be sufficient. Küchenmeister tested a great many of the medicines recommended against *tæniæ*, *by placing live tape-worms in a mixture of the particular medicines with white of egg*, and by determining the time in which they died by the assistance of the rotation apparatus, the two poles of which he introduced into the mixture. According to these experiments, the *tæniæ* lived for many hours, or even for days, in the mixture containing the *cuprum oxydatum nigrum*, in that containing *dolichos pruriens*; and for several hours in *castor*

oil, and in a salad made with *pickled herrings, onions, garlic*, &c. *Tin* has little or no effect, or merely the same effect as the cow-itch. *Electricity* has no destructive action on *Tæniæ*. " It is otherwise, however, with *kousso*, in the infusion of which, mixed with milk, the *tæniæ* died within half an hour of their introduction; and with *oil of turpentine*, in a mixture of which with white of egg, they died in 1—1½ hour. In a decoction of *Bruyera* (*kousso*) mixed with white of egg, the *Tæniæ* died in 1½—3 hours. In a decoction of *rad. punicæ granatorum*, mixed with white of egg, in 3 hours; and with the same decoction, mixed with milk, in 3—3½ hours. In a mixture of *extract. filicis maris æther.* with white of egg, the *Tæniæ* died in 3½—4 hours. The so-called *filicine* (*filicic acid* of Lutz), mixed with white of egg, also has an energetic action on the *Tæniæ*, which die therein in the course of a few hours, and exhibit œdematous swellings in various parts." The particular methods of expulsion, arranged according to the remedies, have been enumerated by Meyer, Seeger, and Küchenmeister; but the faults which this last-named writer finds with his two predecessors, viz. that in the enumeration of methods these are thrown together in a disorderly manner, may also be imputed to himself, although in a less degree.

163. *a.* Methods with Tin. — Frank commences the treatment with the powder of *tin*, or its filings, given in a simple syrup, either alone, or with *sulphur*, or the *extractum absinthii*. After having pursued this plan during three or four days, allowing only a spare diet, he prescribes, in addition to the tin, a moderate dose of *jalap*, low diet being still observed. Dupuis prescribes, without any preliminary treatment, at six, and at half-past six, in the morning, each time a powder of *Stann. rasp. Angl.* ℈ss.; *Tannini puri* ʒi. *Gi gutti* (*cambogiæ*) gr. v.; *Elæosacchari cajuputi*, gr. ij ss.; and after each dose, the patient drinks two cups of black coffee. In two hours, the worm is expected to pass off, usually with colicky pains, on the occurrence of which strong black coffee is immediately given. For the subsequent treatment, a tincture of iron is advised. Becker recommends the chemically *precipitated tin*. According to him, it is certain in its action, does not irritate the intestines mechanically, and is preferable in doubtful cases. It is, however, difficult to be obtained. Küchenmeister protests against the administration of tin-filings, as being, in his opinion, a much too irritating medicine. But he has twice prescribed *tin*, precipitated from chloride of tin, in an extremely fine powder, making it into an *electuary with honey, a little extr. punic. granat., extr. filicis maris æther., and camboge or jalap*. Even young and weakly children support this remedy very well. On one occasion, the entire worm passed, dead, on the second day. In the other case, an adult, several yards passed after this medicine, but the remainder of the worm was expelled by his ordinary mixture (§ 181.). He considers the medicine to be uncertain, but suitable to children, and persons who are much reduced. *Tin*, in various combinations, has been prescribed, also, by Alston, Mayer, Matthieu, Hautesiark, and Autenrieth; but its operation, as they have prescribed it, is often either ineffective, or too irritating to the digestive mucous surface.

164. *b.* Methods with the Male Fern. — *The Aspidium filix mas*, which is always efficacious against the *Bothriocephali*, is much less so against *Tæniæ*. Buchheim prescribes a soft resin, obtained from this plant, with good effects. The most efficacious preparation, according to Küchenmeister, is the *æthereal extract of Filix Mas*, the powder being mixed with the extract, so as to increase the surface of contact of the medicine; or the extract being mixed with pomegranate root, which latter he prefers.—(*a.*) Wawruch's method is a *preliminary treatment* of three to four days, consisting of strong beef-tea with white bread, three times a day, taking at the same time the following resolvent: — ℞ *Rad. taraxaci et cichorei*, āā. ʒj.; *decoque per* ½ *horæ: colaturæ* ℥vj., *adde ammon. chlor. præcip.* ℈j.; *syrupi cichorei cum rheo* ʒss. M. Two table-spoonfuls every two hours. With this, daily laxative clysters of milk, linseed, herb. althææ, flor. verbasc., and flor. papaver. are ordered, and on the evening before the expulsion, a very rich gruel (½ lb. of water and 2—4 ounces of butter and wheat bread). *The expulsion* is attempted by taking, "in the morning fasting, a thick gruel; and about five, six, and seven o'clock, a clyster of linseed and milk; about eight o'clock, two table-spoonfuls of castor oil; at half-past eight, pulv. rad. filicis maris ℈ij.—℈iv.; at nine o'clock, two table-spoonfuls of castor oil; at half-past nine, the fern-powder again; at ten o'clock, two table-spoonfuls of castor oil; and at half-past ten, the third powder. After each dose, the patient washes his mouth with tea made from flor. tiliæ, and summitat. millefolii; and in the intervals, he chews flavid. cort. aurantior., of which a dose of ʒss. is prescribed. At one o'clock, he takes a powder of camboge and calomel aa. gr. v.—vj., with ℈ss. sacch. albi, and applies emollient poultices over the abdomen. If the worm be not expelled, castor oil is again given in half an hour; in a second half-hour, camboge powder; then castor oil again; and possibly, if no inflammation occurs, the powder of camboge and calomel again at half-past four. At the same time, a clyster is administered every hour!" The subsequent treatment consists of the removal of the inflammatory state of the intestines by leeches, mild diet, &c.

165. (*b.*) *Weisshaar's method* is a modification of the above. On the second, third, and fourth day of *preliminary* treatment, a pickled herring diet; and on the following day, he attempts the *expulsion* of the worm nearly as advised by Wawruch, excepting that he gives the castor oil in meat broth, and, instead of orange-peel, candied calamus. Of the fern-powder he gives only xv.—xx. gr. *pro dosi*, with 15—20 grs. olei filicis maris; and even the latter only to irritable subjects. Recently he prescribes 60—80 drops ol. filicis maris with ʒss. ol. ricini; in half an hour, two table-spoonfuls of castor oil; in an hour, the first powder of camboge and calomel; in half an hour, oil again; in another half-hour, the second powder of camboge and calomel, and so forth. He states that he easily expels *T. solium* by this method; but that *T. mediocanellata* (§§ 68—70.) requires strong doses of oil of turpentine.

166. (*c.*) *The Wurtemberg method* is one ounce of fern-root boiled for an hour with three pints of water; one drachm of fresh *cort. mezerei* is added to the hot decoction, which in ten or twelve minutes is strained, and then mixed with two or

three drachms of finely powdered fern-root. This is taken in the morning fasting, either at once, or in three portions at intervals of an hour. In three or four hours, sickness and disorder of the stomach cease; and then calomel, freshly prepared sulphate of iron, aa. gr. x.—℈j., according to age, are administered, and repeated if vomiting occur. The worm is said to be generally expelled in the evening; when this is not the case, a rich gruel is given on the same evening; and on the following morning fasting, rhubarb and jalap, aa. gr. x.—xv.—ʒss.

167. (*d.*) *Alibert's and Dubois' methods* are nearly the same, and as follows: — After a preliminary treatment for eight days, to which garlic, roasted under the ashes, is added, the abdomen is to be rubbed several times a-day with a liniment of camphor, with balsams and nut oil, and with crushed bulbs of garlic, also a ptisane of *helminthocorton* and *filix mas*, and a nightly enema of marsh-mallow water are prescribed. Without this preparation, ALIBERT prescribes —

No. 380. ℞ Rad. Filicis Maris, ʒiv.; — Coque cum Aq. Font. ℔iij., usque ad remanentiam ℔ij.; — Colaturæ adde Syrupi Helminthocort. ℥ij. M.

This is to be drunk in cupfuls during the day. After three hours of repose, calomel and corn. cerv. ust., of each gr. iij., made into a bolus with conserv. rosæ q. s., are given. In the evening, ℥j. of oil of sweet almonds; and on the second day, the following purgative: —

No. 381. ℞ Scammonii, gr. xviij.; — Rad. Filicis Maris, ʒj.; — Cambogiæ, Calomel. āā. gr. xij. M.

To be taken in three portions in sugar and water. DUBOIS, after the preliminary treatment just noticed, prescribes, early in the morning, ℥ss. of filix mas in broth; and every half-hour one of the following: —

No. 382. ℞ Res. Jalap., Scammonii, Cambogiæ, āā. ℈ss.; — Syrupi Rhamni Cathart. q. s. ut fiant Boli, sing. gr. vj.

168. (*e.*) *Biching's and Seeger's methods.* The former commences with draughts and clysters of cold water, and with full diet and cold baths. With this diet, but without the cold water, according to SEEGER, a saturated decoction of ℥ss. of fern-root is drunk cold after every meal, when the worm will be expelled in from three to fourteen days. SEEGER's plan, according to KÜCHENMEISTER, is suited to irritable and weak persons.

169. (*f.*) *Nuffer's and Odier's method.* The evening before the treatment, the patient takes a thin gruel with two ounces of butter; a quarter of an hour afterwards, a glass of wine, and, if necessary, a clyster. The next morning fasting, ℥iij. pulv. fil. maris in ℥iv.—℥vj. aq. tiliæ. If vomiting occur, this is to be repeated; and if sickness be felt, black coffee is taken. Two hours after this, the following bolus is given: —

No. 383. ℞ Calomel., Scammonii, āā. gr. x.—xv.; — Cambogiæ, gr. v.—vij.—viij.; — Confect. Hyacinth. q. s. Misce.

For weak patients and children, in two doses. If the bolus be thrown up, or not have operated in four hours, or if the worm hangs out of the anus, ʒvj.—℥j. of Epsom salts, dissolved in warm water, are given. If the worm be not expelled by this, the gruel and powder are to be repeated, but the Epsom salts are to be given instead of the bolus. ODIER directs a table-spoonful of castor oil in meat broth every half-hour instead of the bolus. This treatment is said to be certain against *Bothriocephali.*

170. (*g.*) *Blossfeld's and Rapp's method* is much praised. The previous evening, a thick mixture of bread and milk is taken; and in the following morning ʒj. *pulv. rad. fil. maris* is given every hour, in an ounce and a half of nutmeg tea. After six or eight doses, the worm is expelled. RAPP directs the root to be fresh, and administers ʒvj.—℥j. of it one dose.

171. (*h.*) *Mayor's method.* MAYOR, of Geneva, regards the root of *filix mas* as specific against *Bothriocephalus*, and *tin* and *pomegranate root* against *Tænia solium*, and states that the powder of the fern-root should appear quite green, as it is otherwise inefficacious. He gives ʒiij.—ʒiv. in a mixture of balm tea and ℥j. of gum syrup. This draught is to be taken at night, and ℥jss. of castor oil the next morning. MAYOR, in some cases, instead of the powder, prescribes the *oleum filicis maris* in the form of pills,—thirty to fifty drops in twenty-four pills, of which twelve are taken at night, and twelve in the morning, and an hour afterwards ℥jss. of castor oil. In other cases, he gives the fern-oil either pure, or mixed with castor oil, in doses of ʒss.—ʒj.; but usually the castor oil afterwards.

172. (*i.*) *O. Bang's method.* "For three days, the patient takes only one basin of meat broth, with white bread. At night, he has a clyster of warm milk. On the fourth day, he takes also eight cups of black coffee with plenty of sugar, and two to three large pickled herrings in the form of salad, with plenty of vinegar, pepper, oil, and onions. On the fifth day, he takes alternately, every two hours, one third of a herring, and a heaped-up tea-spoonful of pulv. rad. filicis maris, and with this two to three cups of coffee. At night, a milk clyster and a dessert-spoonful of castor oil. On the sixth morning, fasting, two tea-spoonfuls of fern-powder; an hour afterwards, two table-spoonfuls of castor oil, and the same quantity every two hours until the worm is expelled. During this he drinks tea; and, lastly for the subsequent treatment, iron is used."

173. (*k.*) *Ullersperger's method.* Without any previous treatment, he gives ʒiij.—ʒiv. of the bark of the roots freshly peeled, treated with alcohol the day before, and lets the patient lie in bed. When no vomiting takes place within two hours, an aperient of 6 gr. calomel and ℈j. of sapo jalap. in pills is given. This method is said to be rapid and efficacious.

174. (*l.*) *J. P. Frank's method* is to commence either with the exhibition of *tin*, as above, and to follow with the *male fern*, or to begin at once with this latter, giving about three drachms in a draught of cold water, and to give frequently cold diluents, allowing the most rigorous abstinence. A dose of castor oil may be taken the following day, and repeated every two hours until copious evacuations are procured.

175. (*m.*) *Mayer's and Karsten's methods.* On the day when fragments pass off spontaneously, the patient takes a herring salad at night. At six o'clock next morning, ʒiij. of fern-powder in ℥vj. of aq. flor. tiliæ is taken in tea-spoonfuls without stopping, and immediately after this a table-spoonful of castor oil, and then a cup of thin broth. The oil is then continued every half-hour until ℥ij. are taken. For any sensation of fulness and nausea,

hot black coffee is given. About twelve o'clock, the greater part of the worm is expelled, and the head passes at one or two o'clock. Bitters are prescribed subsequently.—Karsten's method consists of a mild aperient and scanty diet the day before; and early in the morning, ʒiij. of fern-root in teaspoonfuls. If sickness be felt, thin broth is given. Between eleven and one o'clock, the worm is expelled without any further treatment. Several other methods of employing the male-fern root have been enumerated by Küchenmeister, generally premising various means, the modus operandi and utility of which are not very apparent. I shall next notice two other preparations of this root — the *extract* and the *æthereal oil*, which have been used with great benefit. The *compound decoction of male fern*, for which I have given a *Formula* in the Appendix, will be found one of the most efficacious modes of prescribing this remedy. (See *Form.* 62.)

176. (*n.*) *The extractum filicis maris* has been prescribed by several physicians. Peschier administers it as follows: —

No. 384. ℞ Extr. Filicis Maris Æther. ℈j.—ʒss.; — Pulv. Rad. Fil. Maris, q. s. ut fiant Pilulæ xx.

To be taken in two portions half an hour before bed-time, after fasting from five o'clock in the evening; next morning an aperient. Several physicians have adopted this preparation and its mode of exhibition with success. Kieser and Hiller gave the extract, for several days together, to the total amount of ʒiij. with good results. After several days of spare diet, Mösing gave fifteen of Peschier's pills to the fasting patient at nine o'clock, and again at half-past nine. His prescription is as follows: —

No. 385. ℞ Extr. Filicis Maris Æther. ʒjss.; — Pulv. Rad. Fil. Mar. q. s. ut fiant Pilulæ xxx.

After the last dose, he gave ℥iij. infusi sennæ compos. at once. Funk administered the extract night and morning with syrup and gum, and afterwards gave castor oil every hour until it operated freely. Noss prescribed an aperient on the preceding day, and the extract to the fasting patient with syrup—℈ss.—ʒss. of the extract twice with an interval of an hour; then castor oil every hour. Albers, after a restricted diet for one to three days, and on the day before the exhibition of the extract, prescribed a purgative of Glauber's salts; and on the following morning, ʒss. of extract of male fern whilst fasting, and the same quantity an hour afterwards—one to two hours afterwards, castor oil. Rayer gave seventy-two drops of Peschier's thin extract of fern made into pills with the powder of the root, of which eight are to be taken at night, and eight in the morning; two hours afterwards, castor oil. Magendie prepared a *tincture* from the *buds of the fern*, and made it into pills with the powder of the bark of the root, each containing a drop of the tincture. From eight to twenty were said to be sufficient for expulsion of the worm. The circumstance of no further accounts of the employment of this tincture having appeared, is not in favour of its efficacy.

177. (*o.*) *The æthereal oil of male fern* has been much employed and praised by Dr. Jenner. He caused the patient to be kept without food for sixteen or eighteen hours, before he gave the oil; and he further recommends the following mode of administering it: — "For an adult, two pills may be taken at bed-time, containing three grains of calomel, and eight of compound colocynth pill; the following morning, a dose of castor oil. A little broth only should be given till the bowels have been thoroughly cleared out. As soon as that object is effected, one drachm and a half of oil of male fern is to be given on an ounce of some aromatic water; and the dose of oil of male fern is to be repeated in six hours, if the first dose has not proved effectual before the expiration of that time. For a child, calomel and jalap may be substituted for the colocynth and calomel. The dose of the oil of male fern must be as large for the child as for the adult; seeing that its action is on the parasite, and not on the patient, I have never seen any unpleasant results follow its employment in the child." I have, in several cases, given the male fern successfully, when connected, many years ago, with public medical institutions; and since the publication of Dr. Jenner's interesting paper on the use of the æthereal oil of male fern, I have prescribed it in two cases — in one with complete success, but in the other it failed. In this latter, the oil of turpentine and the kousso had been prescribed separately and after considerable intervals, and both had failed, portions of the worm only having come away. An opportunity, however, was not afforded me of persevering in the treatment beyond the exhibition of two doses of two drachms each. The oil was procured from an undoubted quarter. I give, in the subjoined note, Dr. Jenner's account of his experience with this oil.[*] In a case, recorded in

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[*] "The anthelmintics chiefly employed in cases of tape-worm in this country, are turpentine, kousso, pomegranate, and male fern. The objection to turpentine is its horribly nauseous flavour, and its very unpleasant effects on the head, and occasionally on the kidneys. It is a remedy which should be used only as a last resource. Kousso is expensive and bulky. Pomegranate is bulky and nauseous, and, as ordinarily obtained in this country, not very certain in its action. Male fern has the advantages of being inexpensive, only moderately disagreeable in flavour, so that children take it readily, of small bulk, perfectly innocuous to the patient, and more certain than the other agents in its action on the parasite. It is one of the oldest of the remedies for tape-worm, and one of the very best. The preparation I have used is the æthereal oil. An aperient was given in the morning, the patient was kept without food for sixteen or eighteen hours, and then one or two drachms of the oil of male fern were administered on a little cinnamon water.

"I have notes of twenty-four cases to which the oil of male fern was given. Sixteen of these cases were cured by a single dose. In three of these sixteen cases the head was found; three of the remaining thirteen were ascertained to be well two years after the administration of the oil, one a year after, one seven months, two six months, three four months, one three months; and before the other two ceased to be under observation, a second dose was given by way of precaution, as it was to all the patients when the head was not found, without any tænia coming away with the stool.

"Three required two doses of the drug; in one of these three, some yards of tænia were expelled by the first dose; for two months after this no joints were found in the stools, then a few appeared, and a second dose was given, and was followed by the expulsion of nine yards of tænia; the patient continued well two years after this. In the second case, three yards were expelled by the first dose; and a month after, five feet by a second dose; at the expiration of four months and a half, the patient continued well; in the third case, five and a half yards of tænia were expelled by the first dose, and seven yards by the second, given two months after the first.

"Three doses were required in two cases. The first dose of the oil, however, given to one of these cases, was not of good quality. In one of the two, three days elapsed between the first and second dose, and four hours between the second and third. In the other, two days elapsed between the first and second dose, and one between the second and third. In both cases the head was obtained.

"In one case, viz., that of a child five years and six the same journal (August 30. 1856, p. 733.) by Mr. **Sympson**, two drachms of the æthereal oil of male fern, given without preparation, brought away the *Bothriocephalus* in three hours after their exhibition, the worm being voided in two portions with its head connected with the part last voided.

178. *c.* **Methods with Pomegranate Bark.** — **Dioscorides**, **Celsus**, and **Pliny** mention the *radix punicæ granati* as a vermifuge; and in the East its reputation as an anthelmintic remedy has been great from time immemorial. It was introduced into Europe early in this country by **Buchanan**, **Breton**, **Flemming**, and others. **Seeger** states that of 419 cases treated with it up to 1852, 371 are reported as complete cures, 24 as doubtful, and 24 as unsuccessful. **Küchenmeister** adds that he could considerably increase the number of successful cases, partly by his own observations, and partly by those made by others, according to his method — this appearing to be his favourite remedy. The following inferences are stated by him as to *the preparation of the bark:* — 1st, All experiments to ascertain the active principle of the *bark of the radix punicæ granati* have failed. — 2d, This bark is often adulterated, or contains much impurity. — 3d, The bark of the root is more active than the bark of the trunk; ʒ iij. of the former = ʒ iv. of the latter. The bark of the branches has no action. — 4th, The fresh bark acts more gently than the dried bark, but more of it is required; ʒ iij. = ʒ ij. of dried bark. — 5th, According to several authorities, the East Indian bark — which is thicker — should be preferred to the European. — 6th, "After maceration for at least twelve to twenty-four hours, the bark is well boiled; and, according to **Cenedella**, it is better made in earthen than in metallic vessels; it is filtered while hot, as, on cooling, active substances appear to be thrown down again. The decoction was formerly most generally used, but I prefer the extract. The best method of preparing this is as follows: —

No. 386. ℞ Corticis leviter contusi Rad. Punicæ Granati, ℥iv.; macerentur per horas xxiv. cum aquæ destill. ℔j.; posthac coque in leni calore per horas xij. ad remanentiam ℥vj. et cola.

To be taken in three to four doses at intervals of from half an hour to an hour."—7th, According to German physicians, the fresh bark, or the extract prepared in the East Indies from the fresh bark, is to be preferred. Even the fresh bark, cultivated in Germany and in green-houses, is more efficacious than the dried bark. **Waitz's** extract, prepared from the fresh bark in the East Indies, is very active; the dose of it being ʒj.—ʒij. — 8th, "The most efficacious form, under all circumstances, is the solution of the extract in a certain quantity of water. The extract itself, made into an electuary with honey, or administered in pills, is to be recommended where there is great tendency to vomit; but on the whole, its aqueous solution is the best. — 9th, An alcoholic extract is also recommended by **Deslandes**, and recently by **Martins**; and an æthereal extract has been prepared by **Waitz** in Java. Of the latter, ʒiij.—ʒiv. are administered in ℥v. of fennel water with syrupi corticis aurant. ℥j., in three doses, at intervals of half an hour." — 10th, Although boiling water is, to a certain extent, sufficient for the preparation of the active substance of the bark, yet the addition of caustic potash or soda, or of a little white wine to the water employed in the maceration, and afterwards in the decoction, of the bark, greatly increases the efficacy of the extract. — 11th, Bark which has been long kept is to be rejected as inefficacious. — 12th, **Küchenmeister** has recourse to another method of preparing the decoction and extract beside that advised above (6th). It is as follows:—

No. 387. ℞ Cort. Rad. Punicæ Granati. ʒvj.;— Pulv. Rhamni Cathart. ℥j.;— Aquæ Destill. ℔ij.;— Liq. Kali Caustici Concent. ♏x. Macera per horas 12—14; coque leni calore in balneo vapor. per horas 24 ad remanentiam extracti.

The woody parts are to be removed by washing and pressing some time before the conclusion of the evaporation; the washing water being evaporated with the rest. A quantity of this extract, corresponding with the dose of the pomegranate bark prescribed, is to be dissolved in ʒ vj.—viij. of hot water; and, before administration, ℈j.—℥ss. extracti filicis maris æther. may be added, when it is desired to combine the two extracts. (See § 176).

179. *d.* **Methods of Prescribing Pomegranate Bark.** — (*a.*) *Recent bark.* — **Buchanan** prescribes ʒ viij. of fresh bark of the root to be boiled with three pints of water until two pints remain, and drunk in cupfuls, at short intervals, until the worm is expelled. **Küchenmeister** says that, by this violent vomiting, colic and purging are produced. **Breton** recommends ʒ ij. of the fresh bark to be boiled down from ʒ xviij. to ℥ix., or, according to **Gomez**, from ℔ jss. of water to ℔j., and this decoction to be taken by cupfuls. **Mérat** advises ʒ ij. of fresh bark to be infused at night in ℔jss. of water, and left to macerate through the night, and to be boiled down to ℔j. in the morning. After being filtered and well pressed, this decoction is to be taken in three equal parts within two hours. If vomiting occur after the first dose, this should not prevent the

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months old, between the 15th of July and the 4th of August inclusive, five doses of castor oil, and as many of oil of male fern, were administered without a decided effect; a few joints of tænia only being expelled. On the 17th of August, twenty grains of the extract of male fern, obtained from Duncan and Flockhart, of Edinburgh, were given without effect. On August 23rd, one pint of infusion of pumpkin seeds; on September 1st, decoction of pomegranate; and on September 5th, infusion of kousso; all produced copious evacuations, but no tape-worm. The child now left the hospital. In November he was readmitted, and, during my absence, was treated with success, by my friend Dr. **Ballard**, with the oil of male fern. This time the child was kept for forty-eight hours with little, if any, food, before the oil was given. The child was free from tape-worm some months after he left the hospital.

"One man took the oil two or three times without any good effect, but then large quantities of solid fæces were discharged from its action; and before it could be administered in a more effectual manner, the patient escaped observation.

"Among those cured by a single dose, and well two years afterwards, was one man who had taken kousso three times, and oil of turpentine twice. Several of the others had taken turpentine and other remedies with permanent good effect. In three cases (children), the patients rejected the oil by vomiting; with one exception, all admitted that it was much less nauseous than castor oil. In no case did it cause griping or other unpleasant symptoms. The shortest time after taking the oil in which the worm was expelled, was half an hour; the longest, twelve hours; the ordinary time four hours. A large quantity of tenacious yellow mucus was usually expelled either with or before the worm, and often, also, when no worm was present, as when the oil was given to ascertain that no worm remained, the head not having been found.

"In no case was the worm alive when expelled, and in no case was it expelled entire."—(*Association Med. and Journ.*, Aug. 23. 1856, p. 718.)

following doses from being given; but if the patient vomit these, the treatment must be desisted from. According to Schmidtmüller, after one day's fasting, and the administration at night of ℥ij. of castor oil, ℥iij. of fresh bark are macerated for twelve hours in ℥xij. of water, and concentrated to ℥vj.; this is taken in three doses within an hour. Küchenmeister remarks that, "in all these methods, evacuations take place without purgatives, as the fresh bark usually acts as an aperient itself; and in this lies the great advantage of the fresh bark, and a principal cause of the great uncertainty of most of the previous methods, in which the dried bark was employed. To produce the aperient action with certainty, the dried bark needs the addition of purgatives. According to my experience, the neutral salts and the true drastics, such as jalap, are greatly to be preferred to the oils." The decoction of fresh pomegranate bark may also be prescribed as stated in the Appendix. (See *Form.* 69.)

180. This writer prefers the extract. radicis punicæ granati, prepared according to the prescription given above (§ 178. No. 387.), to all other remedies for tape-worm with which he is acquainted; for, in almost every case of expulsion by this medicine, the worm was passed in one piece with the head, or unbroken and in a single coil — sufficient reason, in his opinion, for endeavouring to make the administration of this remedy more agreeable, and its results still more certain.

181. (*b.*) *Combinations of pomegranate bark and male fern.* — This was attempted by Von Klein, and afterwards by Küchenmeister. The latter prescribed it as follows: —

No. 388. ℞ Extracti Radicis Punicæ Granati Aquosi quantum est ex Rad. ℥iv.—ʒvj. solve in Aq. Destill. Fervidæ ℥vj.—viij. Adde Extr. Filicis Maris Æther. ℈j.—ʒss.; — Extr. Tanaceti Vulgaris, ʒij.; — Cambogiæ gr. iv.—vj. ad x. Misce.

A cupful to be taken in the morning fasting; a similar dose in three quarters of an hour. The third is kept in reserve. If the worm be not expelled in an hour and a half after the second dose, the last portion is also to be taken. If vomiting occur, a table-spoonful of the medicine is given every ten minutes; and, to alleviate the tendency to vomit, the patient is recommended to gargle, after every dose, with fresh milk, without swallowing any of it. Small pieces of candied citron or lemon-peel are allowed between the doses. If no evacuation have occurred three hours after the first dose, and the worm have not been expelled, an aperient is administered. "With *tænia solium*, castor oil is usually sufficient; one to two table-spoonfuls every half-hour or hour; or: —

No. 389. ℞ Cambogiæ gr. vj.—viij.; — Pulv. Rad. Jalapæ, gr. x.—xv.

To be repeated in two hours, if required." With *T. mediocanellata*, this writer has found the best results with the following aperient: —

No. 390. ℞ Calomelanos, gr. iv.—vj.; — Pulv. Jalapæ gr. x.—xv.

To be taken at once. After the expulsion of the worm, he advises no treatment, excepting tonics in cases of great weakness.

182. (*c.*) *The preliminary treatment, advised by* Küchenmeister, is as follows: — At the seasons of fresh strawberries and grapes, he gives half a pint of these fruits every morning, fasting, for six to eight days; and on the evening before the expulsion, a herring salad with plenty of vinegar, onions, raw and boiled ham, and plenty of oil; and to very costive persons, ℥j. of castor oil; after which the patient may drink a large glass of light Rhenish wine, or a glass of bitter beer. If the fresh fruits are not to be had, the salad alone will suffice. In very obstinate cases of *Tænia mediocanellata*, he allows the patient to take as much confection of senna with extr. tanaceti vulg. (ʒij. to the ounce of the confection) as will produce two soft motions daily; he then takes the mixture, and not before. Fasting the night before is not advised, as the medicine does not agree well with an empty stomach.

183. *e.* Methods with Oil of Turpentine. — I have prescribed this medicine both as a preliminary means variously combined, and as a direct remedy, or after little or no previous treatment. As a preliminary medicine, I have most frequently given it in the following form: —

No. 391. ℞ Olei Terebinthinæ, ʒij.—ʒiv.; — Ætheris Sulphurici (vel Spirit. Ætheris Sulph. Comp.), ʒiv.—vj.; — Tinct. Camphoræ Comp. (vel Tinct. Benzoniæ Comp.), ℥ss.; — Olei Cajuputi ♏xij.—xx. Tere cum Pulv. Tragacanth. Comp. ʒiij., Pulv. Glycyrrh. ℈ij., et adde Syrupi Rosæ et Syrupi Tolutani, āā. ʒjss., Aquæ Destill. ad ℥viij. Fiat mist. cujus capiat cochl. j. vel ij. larga, 4tis vel 6tis horis, prius agitatâ phialâ.

Cold water, or linseed tea, barley water, &c., may be taken frequently during the continuance of this medicine; and in some cases, as soon as any indication of disorder of the urinary functions occur, a full dose of either castor oil, or of calomel with camboge or jalap, so as to freely evacuate the bowels, should be given. Frequently a considerable portion of the worm is expelled by these means; but, nevertheless, the male fern, or its æthereal oil, or the pomegranate bark, should be taken, as prescribed above (§§ 164—181.), a few hours after the exhibition of the purgative; or, in other cases, a few hours before, especially if the bowels have not been long confined.

184. Küchenmeister states that "the dose of this remedy is ℥ij. at once, in the morning, fasting; and, if no stools result, another ℥j.—℥ij. afterwards (Fenwick and Copland); or ℥j. olei terebinthinæ, made into an electuary with honey, &c., in two doses at night before going to bed (Thompson); or ℥ij.—ijss. (Schmidtmann); or with the olei filicis maris (Mayor). Or the patient, for three days, is allowed to eat only water-gruel with small portions of white bread, three times a-day; and on the next day, when fasting, to take the following: —

No. 392. ℞ Olei Terebinthinæ, ℥j.; — cum Vit. Ovorum, ij.; — Sacchari Albi Subacti, ℥ss. M.

and if the worm is not expelled on this day, the dose is repeated on the following day (Merck). Some also give ℥ij.—ijss., one half in the morning, and the other at night." This is one of the most effective agents against tape-worms, as Lange, Küchenmeister, and others admit. The latter of these writers states that tape-worms laid in turpentine mixed with white of egg, died within one hour and three quarters; and that the touch-stone of a remedy for tape-worms is not whether it expels *Bothriocephalus latus* or *Tænia solium*, but whether it is also capable of expelling the *T. mediocanellata*. That the oil of turpentine is efficacious in the latter case, he can prove; for the finest specimen of this last-named worm was expelled by it. In general, it acts with tolerable rapidity, and entirely. This latter circumstance he regards as a requisite of a good vermifuge in cases of tape-worm, especially as the doctor and the patient are anxious to ascertain the expulsion of the head of the parasite.

185. The principal objections to this substance are its nauseous taste, the inclinations to vomit, the unpleasant eructations, griping pains, and disorders of the urinary excretion, it often occasions. It more frequently produces these unpleasant effects when taken in the form of an electuary. When prescribed in the form of mixture, as above (§ 183.), or suspended by white of egg, or taken either pure in a full dose (℥j.—ij.), or with the addition of castor oil, on the surface of coffee, or milk, or on any aromatic water, at bed-time, or early in the morning, it is generally the most efficacious, and least likely to produce any of the above unpleasant symptoms. It is often taken, with less discomfort, on the surface of Hollands or common unsweetened gin. When castor oil is not given with it, and when it does not act on the bowels in a few hours, either a full dose of castor oil, or of some one of the purgatives already mentioned, should be taken without delay.

186. *f.* Methods with Kousso.—*Kosso—flores kousso*—the dried and powdered flowers of the *Bruyera anthelmintica*, has lately been much in vogue against tape-worm. It has been supposed, by several physicians, to have been adulterated. Küchenmeister supposes that it is not so much adulterated as mixed with other Abyssinian medicines against tænia, as with the powder of the root of *Verbascum ternacha*, and with the powdered leaves of *Jasminum floribundum*. The dose of the powder of kousso is ʒ vj. to ℥j. I have prescribed this remedy in four cases. In the first, successfully in the case of a medical man in Hertfordshire; the entire worm with the head having been brought away, after turpentine and some other anthelmintics were said to have failed; but in two cases, with only a partial benefit; and in one case, without any effect. The writer just mentioned states that he has always been more or less unlucky with this remedy, which, in the ordinary mode of administration, shares all the defects of the other remedies for tape-worms, and easily produces sickness and violent pains in the intestines; and that the worm has generally been expelled by it in numerous fragments, and at most the worm up to the neck; but that he never found the head, excepting once, after a second dose of the kousso, which caused violent pain in the abdomen. Several attempts have been made in Germany to isolate the active constituents of this substance, and to prepare infusions, decoctions, and infuso-decoctions of it, with and without the flowers being retained in them; but, although the effect appeared to equal or to approach that of the powder of kousso itself, yet little was gained, excepting when the quantity (ʒ vj.—℥j.) of kousso usually employed was macerated in cold water for twenty-four hours, and then boiled for half an hour, and the whole taken — without straining — with the flowers in it, in two portions; ℥j. to ℥ij. of castor oil having been given two hours after the second portion. This infuso-decoction was said to have been well borne, and to have acted with certainty.

187. *g.* Notices of several other Medicines and Methods against Tape-worms.—(*a.*) The *Spigelia anthelmintica* has been employed, according to Noverre, in the West Indies; but its effects are unpleasant, and it not easily admits of use in Europe.—(*b.*) *Sabadilla* has been given in a dose of half a drachm of the powder in the morning, the patient having been purged on the previous day with rhubarb and Glauber's salts. The sabadilla powder is given with the same quantity of fennel sugar, and the patient afterwards drinks one to two cups of chamomile or elder-flower tea. If vomiting be produced, worms in the stomach are thrown up. On the second day, the same dose of sabadilla is taken; and if no more of the worm appears, half the quantity of this medicine is taken morning and evening of the third and fourth days. On the fifth morning, whilst fasting, a purgative is administered, and the living or dead worm is brought away. For children from two to four years, two grains of sabadilla powder is a sufficient dose. This medicine is of service against *ascarides*.—(*c.*) The *schebdi—the Phytolacca dodecandra* or *Abyssinica*. The fruit of this plant has been tried in Europe, and fragments of the worm have been brought away; but sufficient trials have not been made of its efficacy. — (*d.*) The *fructus saoriæ*, the fruit of *Mæsa picta*, Hochstetter, has been given in doses of ℥j.—℥jss. with uncertain results. This remedy is easily taken. Its taste is less repulsive than that of other remedies. Nausea, vomiting, and slight pain in the abdomen are often experienced from it. In two cases, the worms were expelled by it up to the head, but always in fragments. This remedy appears to be deserving recommendation for *ascarides* and *oxyurides*.— (*e.*) The *Mucuna—cortex mucunæ*—from *Mucuna anthelmintica*. The dose of the powder is ʒvj., and is usually, in the East, given with honey in a stiff paste. Single fragments of the worm were brought away by it, but the medicine was probably injured by keeping.

188. *h.* Drastic Purgatives with and without Calomel. — Bremser's and Schmidt's methods of employing these medicines are too severe, and are often productive of inflammation of the digestive mucous surface, which may not be allayed for some weeks. I will not, therefore, mention them. According to Ettmüller's plan, the patient takes, at seven o'clock in the evening, calomel. gr. xij., lapid. cancror. ℈j.; and about nine o'clock, olei amygdal. dulc. ℥jss.; which usually operate twice in the night. At seven and nine o'clock next morning, he takes cambogiæ gr. xij., rad. valerianæ, and sem. cinæ, āā., gr. iv., when the worm is afterwards expelled. I much doubt this result. It is quite unnecessary to state the various modes in which the changes are rung upon the purgatives believed to be most appropriate in cases of tape-worm, by writers of no mean reputation, and the several ways these medicines may be combined, and successively administered. Calomel, camboge, jalap, castor oil, the sulphates of potash, soda, magnesia, &c., variously conjoined or administered in succession, with or without valerian, oleum tanaceti, &c., are the chief medicines advised. But, in order to be efficient, their doses, and the repetitions of them, are such as to risk the supervention of inflammation; and in a large proportion of cases they fail altogether.

189. *i.* Inferences. — (*a.*) Simple methods of treatment with the *filix mas* and its *æthereal oil* and *extract* (§§ 176, 177.), are sufficient to remove the *Bothriocephali*.— (*b.*) For the expulsion of *Tænia solium*, the combination of the aqueous extract of the bark of the pomegranate root, with the addition of the æthereal extract of male fern, is considered by Küchenmeister as the most efficacious, camboge, gr. iv.—viij., being preferable to the saline addition mentioned above. — (*c.*) The *Tænia mediocanellata* is generally expelled by the same combination, especially when a powder with calomel and jalap, or camboge, is given afterwards. — (*d.*) In very obstinate cases, the methods with tin, or those with turpentine, or with these latter following the former, may be employed with care and circumspection. — (*e.*) The kousso does not promise any advantage over the above remedies, if, indeed, it be equal to any of them. — (*f.*) When the worms depend from the anus, the German physicians advise a cup of strong black coffee with plenty of sugar to be given immediately. A dose of calomel and jalap, or this followed by castor oil, appears to be more efficient.

190. *k.* Treatment with Kamala (*the red powder obtained from the capsules of Rottlera tinctoria*, Roxburgh). — This substance, long known in India as a valuable dye for silk, has been much employed against tape-worm, which is very prevalent in the Punjab and North-western Provinces of India, and has recently been prescribed with success in this country by Dr. Leared and others. This peculiar red powder may be prescribed in doses of half a drachm to three drachms suspended in water. "A single dose is often found sufficient, and in general it is not necessary to give any other medicine before or after. In some cases, however, where a small dose of *kamala* has been administered, castor oil has been afterwards given with good effect. Dr. Gordon has prescribed kamala in the dose of one drachm, repeated at intervals of three hours. Kamala may be given also in the form of tincture, the formula for which, recommended by Dr. Anderson, is as follows: —

No. 393. ℞ Kamalæ, ʒvj.; — Spiritûs rectificati, ℥xvj. Macera per biduum et cola.

An æthereal tincture may be prepared of the same strength; but it is said to offer no particular advantage over the alcoholic. The dose of *tinctura kamalæ* is from ʒj. to ʒiv., diluted with some aromatic water." (Dr. Hanbury, in *Pharmaceutical Journ.* Feb. 1858, p. 405.)

191. Drs. C. Mackinnon, Anderson, Corbyn, and Gordon have praised the anthelmintic powers of this medicine. Dr. Mackinnon states, that the results have been so satisfactory, that he has continued to employ this whenever a case of tænia presented itself, and that he has given it in sixteen cases without a single failure. In none of his cases, excepting one, did he ever exceed, for a single dose, three drachms. This dose usually purges from five to seven times; and the worm is usually expelled dead in the fourth or fifth stool. In about half the cases, some degree of nausea and slight griping were experienced; in the remaining half, no inconvenience whatever was felt. Dr. Mackinnon states the following as the results of his experience of this medicine: — "1st, That kamala is a safe and efficient remedy for tape-worm, and more certain than either turpentine or kousso; — 2d, That, to a strong European, three drachms may be safely given as a dose; — 3d, That, to a person of feeble habit, or to a female, one drachm and a half, followed, if necessary, by half an ounce of castor oil, is a sufficient dose." Since the above was published, Dr. Mackinnon has administered this medicine to nearly fifty patients, and in two instances only was no worm expelled. (*Medical Times and Gazette*, Dec. 19. 1857, p. 628; and *Indian Annals of Med. Science*, vol. iii. p. 86.)

192. Dr. Anderson states that, "after three drachms of the powder (of kamala) have been administered, the worm is usually expelled in the third or fourth stool. It is generally passed entire, and almost always dead; and in all the cases I have examined (about fifteen), I was able to detect the head. In only two cases do I know of the worm being passed alive. The advantage of the tincture over the powder consists in its action being more certain and milder, and in its being rarely accompanied by nausea and griping. In two or three cases, only two or three stools followed the dose usually given, and the worm was expelled in the second stool; in one patient, only one stool was caused by the medicine, and in it the worm came away dead." (*Ind. Ann. of Med. Sc.* vol. iii. p. 82.) Dr. Anderson alludes to ninety-five cases of tape-worm, in which *kamala* was prescribed, and of this number (eighty-six were European soldiers) he was aware of only two in which no worm was expelled. Dr. C. A. Gordon remarks, that "with this medicine there is no unpleasant effect. It is not even necessary to take a dose of purging medicine as a preparative; and, beyond a trifling amount of nausea and griping in some instances, no unpleasant effects are experienced; while by far the greater number of persons to whom it is administered suffer no inconvenience whatever beyond what they would from a dose of ordinary purging medicine." (*Med. Times and Gaz.* May, 1857, p. 429.)

193. Dr. Anderson and Dr. Gordon agree in stating that the frequency of tænia in the North-west and Upper Provinces of India arises from the free use of animal food of a very unwholesome character by the European soldiers; whilst among the Hindu natives, whose food is entirely vegetable, this parasite is unknown. Foul-feeding and half-starved pigs, cattle and sheep, as well as ducks, turkeys, fowls, pigeons, equally foul-fed and diseased, are often made articles of diet by the European soldiers, and are justly viewed, by the physicians mentioned above, as the causes of the prevalence of tape-worm in this class.

194. iii. Treatment of the other Worms. — *A. Echinococci, cysticerci*, and *acephalocysts* rarely admit of treatment, and only of surgical treatment. This subject is sufficiently noticed in the article Hydatids.

195. *B.* The comparative rarity of the *Distoma hepaticum* (§§ 98—100.), and the difficulty of its *diagnosis*, render the prophylaxis and treatment of this worm, in some respects, matters of subordinate importance. The *prevention* is either difficult, or impossible, owing chiefly to our imperfect knowledge of its developmental history. As far as this history may be inferred from the subjoined remarks of Küchenmeister, the prophylaxis must be founded on it, and be

viewed as conformable with what has been stated above[*] (§§ 157—160.). The *direct treatment* of *Distoma hepaticum* can rarely be ventured upon with success, owing, *first*, to the almost impossibility of its diagnosis, unless its presence be inferred from the passage upwards or downwards of some individuals of this species; and *next*, from the serious nature of the lesions produced by it. Even granting, then, the detection of the malady, medicines can be exhibited only with great uncertainty as to their beneficial effects. As, in many of these cases, the biliary functions are more or less interrupted, and organic vital force impaired, it becomes necessary to attempt the restoration of the former, and the development of the latter, by suitable means. To remove biliary obstruction, calomel and other mercurial preparations combined according to the peculiarities of the case; the nitro-muriatic acids internally and externally; the preparations of taraxacum, and the mineral waters of Carlsbad, Marienbad, Kissingen, and similar springs. Durand's medicine against gall-stones and obstruction of the gall-ducts has also been recommended. This medicine consists of equal quantities of oil of turpentine and sulphuric æther. It may be given in moderate and frequent doses; or the oil may be conjoined with alcohol, or with nitric æther, or with the sweet spirits of nitre. These appear to be appropriate for this parasite, as the efficacy of the turpentine against other worms, and the rapidity of the absorption of it into the circulation, are indications in favour of the use of it, in cases where the existence of this animal is inferred. Küchenmeister states that the principal ingredient of the remedy of Durand has been successfully administered for *distoma* of some of the lower animals; and that, upon his recommendation, turpentine was administered to several sheep, and followed by a purgative; but the results were not fully ascertained when he wrote. The propriety of enabling the constitution to throw off the parasitic animal by the exhibition of tonics conjoined with alteratives and deobstruents, such as the bi-chloride of mercury with preparations of cinchona; the extract of taraxacum with the solution of potash, and with tonic and bitter infusions or decoctions; and the nitro-muriatic acids with these latter and with taraxacum, cannot be reasonably doubted.

196. *C. The Distoma hæmatobium*, so remarkably prevalent in Egypt (§§ 103—109.), cannot be encountered with any means of *prevention* or of *cure*, upon which any reliance may be placed. Griesinger, who has furnished the chief amount of information respecting this parasite, considers that — 1st, the waters of the Nile used without filtration; — 2d, the bread, grain, and dates employed for food; — and 3d, the use of half-putrid fish; being the chief causes of its existence — the prevention of it must be based on the avoidance of these causes, and of the circumstances connected with them, which admit of avoidance. As regards *the cure*, calomel and turpentine are chiefly recommended by Griesinger, the latter being readily absorbed into the circulation, as first shown by me in a memoir on this remedy, published in the *London Medical and Physical Journal for* 1821. He also advises the use of onions, garlic, &c. The tinctura ferri muriatis, and other preparations of iron, of camphor, assafœtida, &c., variously combined, and long persisted in, may also prove of benefit, especially as anæmia and chlorosis form a marked characteristic of these cases.

197. *D. The Oxyuris vermicularis* (§§ 123—126.) is always treated with difficulty, and, according to my experience, with greater difficulty in old, than in young subjects. Küchenmeister states that internal remedies in general are but little to be recommended. I am of a very different opinion, based upon very considerable experience. This writer advises the long continued use of a tea made from the *flores verbasci*. The flowers are left in the infusion, and used with it. The fine hairs appear to irritate and disturb the worms mechanically. The remedies already noticed for the cure of tape-worm, especially turpentine, the pomegranate root, the filix mas, &c., often bring away the thread-worms, but they are soon regenerated. The permanent removal of them cannot be effected by these or by similar means. Medicines calculated to act upon the lower bowels, and to restore the tone of the digestive mucous surface, and to correct the state of the intestinal secretions and excretions, are especially required against these worms. Dr. Pockels recommends the powder of filix mas and jalap in some suitable vehicle; Küchenmeister, the preparations of the semen cinæ — the santonicum, or semen contra vermes — internally for two days, and afterwards strong purgatives, followed by clysters; Dujardin advises enemata with valerian, or garlic, or wormwood, with the addition of aloes; and many administer clysters of salt water, or a solution of salt in water with olive or castor oil. When the patient is distressed by these parasites during the night these or similar enemata should be administered at bed-time or shortly before. Numerous preparations of the santonicum, and various combinations of this seed with other substances, as the powder (℈ j.—ʒ ij.), the infusion, the decoction, the extract — in the form of electuary, mixture, confection, bolus, &c., — with valerian, or jalap, or calomel, or aloes, or rhubarb, or sulphate of potash, or with sulphate of iron, or with alkaline carbonates, are contained in the Continental pharmacopœiæ, and employed against this and other species of worms.

198. The means which I have usually employed, for many years, against the *Oxyuris vermicularis*, with the view, not merely of removing

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[*] “Although it is still unknown to us how the embryo becomes metamorphosed, and into what *cercaria-sacs* or *rediæ* it is converted, and where these *cercaria-sacs* or *rediæ* live; although we do not know whether the brood of *D. hepaticum* is tailed or tailless, and where it encysts itself, whether free in the water in the manner of *Monostomum*, in aquatic mollusca or insects, or in higher animals which occasionally visit stagnant waters — yet there is much probability that the herbivorous or omnivorous domestic mammalia infect themselves with free encysted young *Distoma*, either by devouring snails which adhere to the grass of the meadows, especially in moist pastures, or by drinking from impure, stagnant waters (marsh or pond water). Exactly the same thing would then take place in man, by means of snails adhering to salad, fallen fruits, radishes, turnips, and other roots. Nay, such small snails might even be introduced with dry fodder into the stomachs of our domestic animals during the winter, by their eating the small species, passing their winter sleep in their closed shells, or the shell-less slugs adhering to roots protected from frost in warm cavities or cellars. Whether the production of *D. hepaticum*, in the human liver, may take place by drinking impure water, must remain quite undecided. The finding of a young *Distomum*, in the sole of a woman's foot, appears to be in favour of an immigration, and a mode of existence similar to the *Cercariæ*.”—(*Op. cit.* p. 270, 1.)

them, but also of preventing their regeneration, and of improving the functions of the bowels and the state of the general health, are, combinations of preparations of iron with those of aloes, taken internally for some days, or even weeks, according to their effects; and afterwards, enemata with olive or castor oil, spirit of turpentine, or assafœtida, camphor, salt, &c., in gruel, according to the peculiarities of the case. The mist. ferri may thus be conjoined with the decoctum aloes compos., or with the tinct. aloes; or the pilula ferri comp., or sulph. ferri, may be given with the pilula aloes cum myrrhâ, the pilula galbani comp. and camphor. Electuaries may also be prescribed in other cases, with the carbonates or oxydes of iron, the santonicum, and confection of senna, with a small proportion of the confection of black pepper; and, if these do not completely remove the annoyance, the use of the enemata already recommended should be adopted (see FORM. 71, 80, 105, 106, 149, 151, and 153). In some cases where these are required, the long flexible tube should be introduced above the sigmoid flexure of the colon, so that the remedies may reach above this part of the bowel. Having removed the worms, it will be of service, in order to prevent their regeneration, to continue the use of the preparations of iron in conjunction with aperients and the other medicines which the circumstances of the case will suggest. The following pills have been found by me, for many years, to be most successful in removing and in preventing the regeneration of the *oxyuris vermicularis* and the *ascarides lumbricoides*, both of which parasites are often present in the same case: —

No. 394. ℞ Ferri Sulphatis; — Quinæ Sulphatis; — Camphoræ, āā. gr. xvj.; — Pilulæ Galbani Comp. ℈ ijss.; — Pilulæ Aloës cum Myrrhâ, ℈j.; — Pulv. Capsici, gr. xvj.; — Olei Cajuputi, ♏xx.; Mucilag. Acaciæ, q. s. Misce, contunde bene, et divide in pilulas xxxvj., quarum capiat unam, duas, vel tres, bis terve in die.

The aloes, in combination with sulphate of quinæ, acts energetically on the bowels; therefore the dose of these pills should be regulated according to their operation; a larger dose being given for the expulsion of the different species of ascarides; and the smaller doses, for the prevention of their regeneration. The enemata already recommended should also be administered after the pills have been taken during two, three, or five days, the repeated exhibition of these latter rendering the former more efficient and generally successful.

199. *E. The Strongylus gigas* (§§ 128—130.). This worm, which is found chiefly in the kidneys and urinary bladder, can hardly be inferred to exist during life, unless its discharge takes place, which very rarely occurs. KÜCHENMEISTER remarks that, if several worms, or one large female, be present, the kidneys will be enlarged, so that the enlargement may be detected by palpation, percussion, and perhaps by inspection; but the cause of this swelling, or any flow of blood from the urinary passages, or of any existing retention of urine, could be referred to the presence of these worms only when any of them are passed from the bladder; and in this case, the *treatment* would be chiefly to alleviate irritation by mucilaginous and oily medicines, and emollients, demulcents, &c. The oil of turpentine, internally and externally, may probably be of use in some instances.

200. *F. The Ancylostomum duodenale* (§§ 132—135.) is one of the inflictions on Egypt and some other tropical countries, and to GRIESINGER we are indebted for all we know respecting it. Unacquainted at first with the real cause of the disease which it occasions — with the prevalent anæmia, chlorosis, &c., produced by it—he had prescribed iron, quinine, calcaria phosphorica (*phosphate of lime?*), &c., with much benefit in slight cases, but never with complete success in those which were severe. KÜCHENMEISTER states that, in one of his last dissections, a sudden light broke in upon him on this subject, when he found the duodenum, the jejunum, and even the upper half of the ileum, entirely filled with fresh, red blood, only coagulated here and there, and thousands of *Ancylostoma* on the mucous membrane of the small intestine, each with its little ecchymosis resembling the bite of a leech. Although he thus left Egypt, and could collect no further clinical observations, he told the Arabian prosector, "You must now employ calomel and other anthelmintics against these *Ancylostoma* and the *Distoma* of the portal vein, in short, against the tropical chlorosis, as well as against hæmaturia, stone, dysentery, abscess of the liver, and all the undetermined diseases of tropical countries, perhaps even some of the tropical fevers, and investigate the latter illness itself, with reference to the most recent helminthological discoveries." Above all things, GRIESINGER praises calomel and oil of turpentine *à priori*, the latter, indeed, especially for the *Distoma* of the portal vein, above all for the *Ancylostoma*, as it certainly reaches the worms situated in the uppermost parts of the intestine; in substance, worms die in it very readily, and it also acts as a styptic upon the injured, bleeding vessels. This last remedy when mixed with castor oil, or with castor oil and a few grains of santonine, or the *natron santonicum*, to which vegetable purgatives are added, must prove particularly efficacious. "None of our colleagues working in the tropics should forget that tropical chlorosis is the consequence of the repeated, small intestinal bleedings, which scarcely betray themselves externally, caused by intestinal worms, especially *Ancylostoma*."

201. *G. The Filaria Medinensis* (§§ 138—142.). *a.* The *prevention* of this worm may be inferred from the causes and circumstances connected with its occurrence, namely, the endemic prevalence of filaria in certain climates and localities, its youngest brood living free in the water, or in wet grass, marshes, or moist soil, &c. Hence, wading through these places with naked feet, or exposing naked parts of the body to foul or impure water, should be avoided, as sources from whence the brood comes in contact with these parts, in the native countries of this worm. PRUNER states that an infection of the filaria may occur, as shown by numerous facts, even in those tropical regions in which the worm is not endemic, an actual transfer from one person to another, or to dogs and horses, taking place. BREMSER says that, even in his time, the worm had become naturalised in Curaçoa by the importation of negroes. No one, therefore, should use the same vessels employed by the patient in bathing, or washing the feet; and that great caution should be observed with the bandages of such patients.

202. *b. Curative Treatment.*—At the commencement of its growth, this worm is said, when super-

ficial, to be easily killed by poultices of boiled garlic. When quite superficial, an incision is made upon it, and the worm pulled out with a hook. Slave-dealers rub in civet and musk on its first appearance. But the worm often produces no annoyance for a long time — six to eight months. When it inflames and ulcerates the integuments over its seat, the part of which appears is seized, and carefully pulled and fastened to a roll of linen or stick, and gradually extracted by turning these twice daily. Some writers advise, when the worm is felt, to cut down through the integuments, making an incision of several inches long, and removing the worm in a loop, or wedging into a piece of wood, and then pulling now on one side, and now on the other; the muscles being all the while relaxed. If inflammation, swelling, and pain are great, and the worm resists dragging, or break off, these symptoms are to be treated in the usual way, by poultices of linseed meal, or of onions and bread, or onions boiled in milk, or of roasted onions, &c. In these cases, numerous means have been recommended in addition, but none of them appear very appropriate or successful.

203. From the most ancient periods, the breaking of the worm has been considered a very serious accident; and severe inflammation, fever, gangrene, &c., have been, even by some modern writers, said to have resulted from it. According to the observations of most authors, who had themselves suffered from the breaking of the worms, violent swelling, inflammation, fever, sleeplessness had occurred, and were cured only when they were killed. The diagnosis, in cases of *Filaria Medinensis*, should always be correctly made, in order to determine the presence of this worm, and to distinguish between Furunculi (see that article) and inflammatory swellings caused by it.

204. *H. The Treatment of Ascaris lumbricoides* (§§ 144—149.). — *a.* For the *prevention* of this worm, it is necessary to bear in mind the circumstances in which the eggs may occur, and the long period during which they may be preserved. Richter ascertained that the eggs may remain in sewage and foul water for some time, and that they attain their full maturity, and undergo the process of segmentation in this situation. Barry, Bischoff, and others have shown that alkalies and salts do not prevent this process. Verloren, that a period of eleven or twelve months is required for the completion of this process in the *Ascaris lumbricoides*. Richter and Küchenmeister state that eggs which had been put in water had not shown any appearance of embryos several months afterwards. As to what becomes of the ready-formed embryos, nothing is known positively; they probably get into our bodies with water, and perhaps this is sufficient for their development.

205. *b. The Cure of Ascaris lumbricoides.* — The number of medicines recommended with this object are so great that the judgment is distracted respecting them. In order to assist the selection, it has been attempted to determine the effects of the most reputed vermifuges upon living intestinal worms from recently killed domestic animals, by Redi, Andry, Leclerc, Torti, Arnemann, Chabert, and others. More lately, Küchenmeister has had recourse to similar experiments made in the temperature of the animal, by mixing the anthelmintic in white of egg, and placing the living worm in the mixture; and has given us the following results, "arranged according to the time in which round-worms died in white of egg mixed with the various remedies: —

206. "1. Death took place in one to two hours in white of egg mixed with creasote, and large doses of common salt, and corrosive sublimate.

207. "2. Death took place in two to five hours in white of egg mixed with petroleum, cajuput oil, oil of turpentine, mustard, weaker solutions of common salt, and washed herring's milt.

208. "3. Death took place in five to fifteen hours in white of egg mixed with garlic, onions, laurel, cloves, wood vinegar, rad. pun. granati, tinct. gallarum, concentr. sol. of sulph. soda.

209. "4. Death took place in fifteen to twenty-four hours in white of egg mixed with camphor, anise, and infusions or decoctions of ginger, gentian, elm-bark, kousso, and hops.

210. "5. Death took place after twenty-four hours in white of egg mixed with infusion or decoction of parsley, rice, milfoil, tansy, valerian, chamomile, wormwood, myrrha, quassia, calamus, ipecacuanha, walnuts, china-bark, willow-bark, oak-bark, catechu, kino, assafœtida, gum ammoniac, Peruvian balsam, ol. ricini, aqua picis, creasote water," &c.

211. This writer states that besides the remedies here enumerated, he has tested the semina cinæ (santonici) with their preparations. In a mixture of white of egg with coarsely powdered seeds, the worms live for days; and in a mixture of white of egg with a strong infusion of semin. cinæ, with repeated additions of unboiled powder, they also lived for days. In a mixture of *santonine* with water and white of egg, the worms lived for days; and also in white of egg with santonine and a little vinegar. At the same time, however, the total insolubility of the santonine was proved by further experiments. In white of eggs mixed with castor oil and santonine, the worms died within an hour; but in this experiment the temperature was raised too high. In a mixture of white of egg with *natron santonicum* (santonate of soda) dissolved in water, ascarides lived more than twelve hours. These experiments form an introduction to the treatment advised for *Ascaris lumbricoides* by Küchenmeister, and more especially to the use of the preparations of *santonine*; but he previously notices the employment of the *semina santonici* by other helminthologists, who generally prescribed this remedy in the form of an electuary.

212. (*a.*) Storck's *Formula*:—

No. 395. ℞ Pulv. Semin. Santonici (vel Cinæ), ʒij.; — Rad. Valerianæ Min. Pulv. ʒj.; — Rad. Jalapæ Pulv. ʒss.; — Oxymellis Scill. q. s. ut fiat electuarium molle.

One teaspoonful every three hours.

213. (*b.*) Selle's *Tonic Worm Electuary*:—

No. 396. ℞ Pulv. Seminum Cinæ, ʒvj.; — Ferri Sulph. Cryst.; — Extr. Chinæ Fusc., āā ʒij.; — Syrupi Cinnam. q. s. ut fiat electuarium molle.

One tea-spoonful three times a day. This electuary is to be preferred some time after the expulsion of Ascarides, and to ascertain their permanent removal.

214. (*c.*) Hufeland's *Worm Electuary*:—

No. 397. ℞ Pulv. Sem. Santonici, ℥ss.; — Pulv. Rad. Jalapæ, ʒj.; — Kali Tartar. depur. ʒij.; — Pulv. Rad.

Valerianæ, ʒ jss. ; — Oxymel. Scillæ, ʒ vj. ; — Syrupi Simp. q. s. ut fiat electuarium molle.

One tea-spoonful every two or three hours.

215. (*d.*) CLARUS and other German physicians advised the Semin. Santonici, coarsely powdered, to be sprinkled over bread, and spreading syrup or honey over the powder, administering from ʒ ss. to ʒ j. several times a day in this manner, followed every third or fourth day by a purgative.

216. (*e.*) BREMSER'S *Electuary* :—

No. 398. ℞ Seminum Santonici vel Tanaceti Vulgaris ruditer contusorum, ℥ ss. ; — Pulv. Rad. Valerianæ, ʒ ij. ; — Pulv. Rad. Jalapæ, ℈ jss.—ij. ; — Tart. Vitriol. (Potassæ Sulph.), ʒ jss.—ʒ ij. ; — Oxymel. Scillæ q. s. ut fiat electuarium molle.

A tea-spoonful to be taken two or three times a day. After taking two tea-spoonsfuls daily, for three or four days, slime and worms pass off with more copious stools. If the worms are not expelled, BREMSER administers some more of the electuary twice or thrice. If the first pot of electuary be insufficient, a second is taken, but watery stools must not be produced. He never allowed more than two potfuls to be taken ; and he considered it unimportant whether worms passed or did not pass during its use. To relax the bowels once in the midst of this treatment he prescribed the following :—

No. 399. ℞ Pulv. Rad. Jalapæ, ℈ j. ; — Pulv. Fol. Sennæ, ʒ ss. ; — Potassæ Sulph. ʒ j. Misce. Fiat pulvis in partes iij. vel iv. æq. divid.

Half a powder to be taken every half, or every hour, or two hours, until it operates. For leucophlegmatic subjects he often gave CHABERT'S oil (composed chiefly of turpentine rendered still more nauseous) in doses of two tea-spoonfuls in water night and morning.

217. The Semina Santonici, KÜCHENMEISTER states, have been recently displaced by the preparations obtained from them, and in his opinion with justice. He extols chiefly two of them, viz. Santonine and the Santonate of Soda ; all the rest being unnecessary. He considers it to be preferable to administer Santonine with fatty oils, in order to bring it into solution as readily as possible ; and for this purpose he prefers to give it sprinkled upon bread and butter, or in the yolk of an egg with sugar ; and afterwards to follow it every three or four days with a gentle purgative (jalap or confection of senna), or to administer it in castor oil— gr. ij. to iv. of the *santonine*[*] in ℥ j. of the oil, to be taken in tea-spoonfuls until purgative action commences. In this way the remedy should be repeated, if possible, for some days, or every other day, so that soft stools, rather than actual purging, should be passed. Milk and butter-milk may be taken during this treatment. " Amongst the santonine lozenges, those prepared from cocoa, undeprived of oil, are most deserving praise." KÜCHENMEISTER remarks that the most troublesome effects of this remedy are spasms, obstructions, with tenesmus, and even bloody stools ; but that with a careful employment of the remedy (gr. ij. to iv. with ℥ j. of castor oil) he has never seen ill effects produced by it, the administration of it with castor oil always preventing intestinal obstructions. The most annoying symptom, to the patient only, is the yellow or blue, or even green, appearance of objects, owing probably to the effect of this remedy on the nervous system ; but this appears to be only a temporary inconvenience, which soon disappears after the discontinuance of the remedy. This writer adds that " it follows, as a matter of course, to be cautious in the use of santonine, that he would never give more than eight grains of it in two days, divided into doses of two grains each twice a day, and that, on the second day of its use, he would administer an aperient."

218. (*f.*) *The Santonate of Soda.—Natron Santonicum* has recently been greatly praised by H. E. RICHTER and KÜCHENMEISTER, for its successful action in cases of *Ascaris lumbricoides*. The latter of these physicians states that he has never seen injurious effects from this medicine, even when administered in doses of eight to ten grains twice a day to adults. " The remedy to be given alone, as every acid decomposes it, and it must not be mixed in electuaries." He adopts nearly the following method :— He lets children (or adults) take a powder of *santonate of soda* with sugar (from two to six grains) on a Friday night, and he repeats the same dose on Saturday morning (fasting) and evening, and again on Sunday morning. On Sunday, half an hour or an hour after the last powder, an aperient electuary (confectio sennæ, &c.), or a sufficient dose of jalap, is taken, so that several soft motions may follow. By these means the worms usually pass off alive ; or they wander forth singly afterwards, and without stools, their residence having become disagreeable to them. Dr. POCKELS, who noticed a blackish discoloration of the tongue after santonine, praises, as a remedy for *Ascaris lumbricoides*, the root of *Aspidium filex mas* in conjunction with purgatives.

219. (*g.*) I have found no remedies more efficacious for the *Ascaris lumbricoides* than turpentine as prescribed above (§§ 183—185.) and in *Form.* 216, and the *infusion of spigelia and santonicus*, as directed in *Form.* 264 in the APPENDIX. For this worm, also, as well as for the *Oxyuris vermicularis*, the preparations of the *semina santonici*, prescribed in the APPENDIX, will also be found successful. (See *Formulæ* 71, 80, 105, and 106.) These and other medicines will be frequently as successful without, as with, the preliminary treatment recommended by the German writers ; the exact operation of such treatment often being not very manifest. The great success derived from the *powder* and *tincture of kamala*, in India, in the treatment of *tape-worms* (see §§ 190—193.), and the effects of this substance upon these worms, promise similar results from it, if it were prescribed against the *Ascaris lumbricoides* and the *Oxyuris vermicularis*.

220. iv. AFTER-TREATMENT OF WORMS.—It is often requisite after the expulsion of intestinal worms has been effected — 1st, To soothe the irritation, and to subdue the inflammatory action produced in the digestive mucous membrane by the vermifuges and drastic purges which had been prescribed. 2nd, To remove any stray worms which had become so sickened, or so injured by the treatment, as to be readily thrown off by means

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[*] The preparation of *santonine* is best effected by the employment of ammonia. It must be tasteless, when pure, because it does not dissolve in the mouth. Dissolved in alcohol, it is bitter. It is sparingly soluble in warm water ; but is readily in oils. It is inodorous, has a slight acid reaction, combines readily with alkalies, and becomes yellow in the light of the sun. When impure, it still contains resins and essential oils, and is consequently nauseous to the taste. — (CALLOND, in *Pharmac. Centralblatt*, 1849, p. 413. ; and J. CLARUS, in *Handbuch der Speciellen Arzneimittellehre*, 1852, p. 333.)

which would restore the vital tone of the bowels and further injure the worms, and render their residence disagreeable or untenable. And 3rd, To prevent the regeneration of these parasites by removing their ova and rendering the digestive mucous surface ungenial to their development. (*a.*) The *first* of these intentions is best accomplished by emollients and demulcents with small doses of nitrate of potash, of hydrocyanic acid, and syrup of poppies, &c. When sickness is troublesome, and no inflammatory action is present, a pill with half a drop of creosote, may be given with each dose of the above, or may be taken in the intervals between each. The diet should be spare, light, and digestible, and the bowels assisted by gentle laxatives, such as magnesia, with or without confection of senna, and by suitable enemata, especially by such as contain castor or olive oil, with oil of turpentine when the irritation is chiefly experienced in the stomach and upper portions of the intestinal canal; at the same time, the warm bath, or terebinthinate embrocations, or a recourse to these latter upon leaving the bath, will be found of much service. The drink of the patient should be demulcent, and in small quantity; thirst in these cases being most relieved by sucking small morsels of ice.

221. (*b.*) The *second intention* presupposes either the non-existence or the removal of those conditions against which the first intention was directed, and consists in the occasional exhibition of a moderate or less irritating dose or doses of the anthelmintic suitable to the expulsion of the worm found to be present, and the combination of it with such other means as the peculiar features of the case will suggest; a recourse to vermifuge clysters, especially to those already suggested, or those advised above (§ 194.), being had after the internal remedies had been taken.

222. (*c.*) The *third intention* is of no small importance if the permanent cure of the patient be considered. For the original conformation, or the depression of vital power, of the patient; or the irritability and exhaustion of the digestive canal, may be so great in consequence both of the existence of these parasites and of the means taken to expel them, that a tonic and restorative treatment becomes imperative in order to prevent various unpleasant contingencies. Besides, in many instances, anæmia has become so considerable as to require a treatment directed more or less to it, and to the other morbid tendencies. In these circumstances not only should due care be directed to the prevention of intestinal worms, but recourse should be had to those medicines which are calculated to restore the vital tone of the digestive organs, to improve the state of the secretions and excretions of the body generally, but of the intestines in particular, to promote the functions and actions of the bowels, and to render the human intestinal canal an unsuitable and an uncongenial habitation for the ova of worms and for their development. These are objects which should always be entertained after the expulsion of worms of whatever species, and should be attempted by such means as are most likely to accomplish them. It may be asked, however, where are we to find, how are we to combine these means, and how are we to prevail on the patient to persevere in their use, or even to have recourse to them when he believes himself free from his enemy? I cannot say that there are no other means calculated to attain these objects, but I may enumerate[*] those which I have employed with these views, combining them variously, and exhibiting them in such successions, intervals, &c., and as the circumstances of particular cases appeared to require. The medicines which I have thus employed are the preparations of iron, assafœtida, of cinchona and quina, of myrrh, camphor, aloes, infusions of willow, cascarilla, and cedar bark, berberine, &c. The compound mixture of iron may be given with the decoction or tincture of aloes, &c.; or the sulphate of iron may be prescribed with sulphate of quina, compound galbanum pill, and with the aloes and myrrh pill. Camphor may be conjoined with these latter substances (§ 198.) singly or in the combination now stated. The sulphate of quina may be given with dilute sulphuric acid, and sulphuric æther. The infusions of the barks may be taken with tonic and laxative tinctures, or with the mineral acids, &c., and laxative electuaries may be conjoined with sulphur, or antispasmodics, aromatics, or spices.

223. It is obvious that the *diet* of patients who have suffered from worms should be nutritious, digestible, and restorative; whilst it ought not to be too rich or full, or calculated to produce general plethora or local congestions, as of the liver, &c. The *regimen* ought to be regulated so that sufficient exercise may be taken in the open air, and that all causes of debility and exhaustion should be avoided. The remarks already offered for the prevention of the human entozoa (§ 157. *et seq.*) are equally necessary to the prevention of their return after their expulsion.

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[*] I may here state that the pharmacopœias of the United Kingdoms are very deficient in vermifuge remedies, and in formulæ for the preparation and combination of them — a remark by no means applicable to the pharmacopœiæ of most continental countries. But verminous diseases are much more prevalent on the Continent than in the British Isles, in which, however, I am confident that their prevalence has hitherto been much underrated, and their importance undervalued. The very general and noxious vice of smoking tobacco, and of otherwise using this poison — so much extended in recent times — has rendered, and will still more render, verminous diseases more prevalent, by weakening the digestive organs, and disposing them to the generation and development of the ova of worms.

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YAWS. See VENEREAL DISEASES (§ 85. *et seq.*).

ZYMOTIC DISEASES. — *ζυμωτιχός*, causing to ferment,—*ζύμωσις*, a fermentation—*ἥπατος ζύμωσις*, a swelling of the liver, HIPPOCRATES.

The term *Zymotic* has recently been applied by Dr. Farr to *epidemic*, *endemic*, *infectious*, and *contagious diseases*, and has comprised small-pox, measles, scarlatina, hooping-cough, croup, thrush, diarrhœa, dysentry, cholera, influenza, ague, remittent fever, typhus, erysipelas, syphilis, hydrophobia. Viewing the Greek term to mean a *leaven* by which the organic nervous system, or the vascular system and blood, may be infected or contaminated, either successively, or contemporaneously, or nearly so, the term well designates an extensive class of diseases, although its application implies an hypothesis: but it is well suited to the arrangement adopted by Dr. Farr in his admirable Annual Reports of Deaths, &c., in England (which see).

SUPPLEMENT.

SUPRA-RENAL BODIES.—Synon:—*Glandulæ ad Plexum, Glandulæ ad Plexum Nervium*, T. Wharton; *Glandulæ supra-renales, Renes Succenturiati*, Auct.; *Supra-renal glands, Supra-renal capsules, &c.*

1. I. Structure and Functions.—In the present state of our knowledge the name "*supra-renal bodies*," or that adopted by Wharton, appears more correct than supra-renal glands, the functions of glands not having been proved in respect of them; and the term, capsules, is equally inapplicable, even to their more external structure. Succenturiati, or reserved kidneys or bodies, are not less appropriate. The earliest notice of the connections and nature of these bodies appear to have been taken by Wharton, who pointed out their relations to the ganglial nerves, as remarked by Dr. Gull. Nevertheless the functions and diseases of these bodies received no attention from physiologists and pathologists (although in several instances, organic lesions observed in them had been published in the *Ephemerides Naturæ Curiosorum*, and more recently by Vetter and Baillie), until very lately, when the structure and functions of these bodies were remarked upon by Nagel, Bergmann, Ecker, Kölliker, Leydig, and Grey; and their diseases, especially in connection with a bronzed discoloration of the skin, were first investigated by Dr. Addison, and subsequently by Mr. Hutchinson and others. It is chiefly, however, to Dr. Addison that the distinction of having first directed attention to these lesions is due. Although several cases have been recently observed and recorded — not always, however, with due care and precision — still the number of those in which a bronzed state of skin appeared more or less intimately connected with, and most probably caused by, disease of these bodies, is so great as to induce a presumption that where the former appearance exists the latter lesion will be found. In order, however, to form correct views as to the phenomena by which diseases of the supra-bodies are indicated, as well as to the nature and consequences of such disease, it becomes requisite that we should previously briefly inquire into what is known of the structure and functions of these bodies. Unfortunately opinions on these topics have been, and, notwithstanding the frequency of microscopic research in modern times respecting them, still continues to be, very unsatisfactory. Dr. Wharton, about the middle of the seventeenth century first noticed their connections with the ganglia of the solar plexus, and suggested a name for them, which appears more appropriate than any other which has more recently been given them.

2. i. Structure.—Kölliker has very recently described the microscopic appearances of these bodies, and noticed what appears to be their functions, and Dr. Harley has still more recently examined their structure.—*A*. The *cortical structure* of these bodies is described by the latter observer, as consisting of cells, arranged in irregularly-sized rows, in a fibro-areolar matrix, the rows of cells appearing like a number of dark yellow columns placed perpendicularly to the surface. The cells, when examined individually, seem to be composed of a homogeneous cell-wall, filled with granules, pigment, and some fat globules. Each cell has a well-marked nucleus, although not always visible. The cells are arranged in a number of larger and smaller masses, which are placed in regular rows, and thus give rise to the columnar appearance. In some cases, a column is composed of several cell-masses of different lengths, placed end to end; in others it consists almost entirely of one long cell-mass. Each column, as well as each cell-mass, is separated from the others by delicate fibrous tissue, in which are included the vessels and nerves. Sometimes the cell-masses present the appearance of long tubes, enclosing a single straight row of quadrilateral cells. Each cell-mass is closed at the extremities, and is surrounded by a delicate homogeneous membrane.

3. *B*. The *medullary substance*, according to Kölliker, also has a *stroma* of connective tissue, which, prolonged from the cortical lamellæ, pervades the whole interior, for the most part, in more delicate fasciculi, constituting a net-work with narrow, rounded meshes. In this network lies a pale, fine-granular substance in which, in man, and in recent preparations, pale cells of 0·008—0·16‴ are generally observed. These pale cells occasionally present, in their fine-granular contents, a few fat, or pigment granules; their frequently very distinct *nucleus* with large *nucleoli*, their angular form, and occasionally their single or multiple, or even branched processes, resembling the nerve-cells of the central organs, although they cannot definitively be declared to be such. Dr. Harley states that the dark slate-coloured medullary substance is composed of a network of fibres, in the meshes of which are a number of large nucleated cells, which

have been described by various writers as ganglion corpuscles; but he thinks that these, like the cells in the cortical substance, are true secreting cells. This great difference of opinion (so frequently observed amongst microscopists) — the same nucleated cells being considered as ganglial corpuscles by some observers, and as true secreting cells by others — prevents in the present state of our knowledge much reliance to be placed upon the results of microscopic researches, each successive observer being liable to the distrust which attaches itself to his predecessors. However the following is less liable to objection:—

4. C. The *nerves* of the supra-renal bodies are, according to Bergmann and Kölliker, extremely numerous; arising, according to them, from the semilunar ganglion and renal plexus, and to a small extent from the vagus and phrenic nerves; but most probably intercommunicating with, rather than arising from, the latter. In man, Kölliker counted in the right supra-renal body thirty-three trunks, eight of which were $\frac{1}{5}$—$\frac{1}{10}$''' five of $\frac{1}{14}$—$\frac{1}{20}$'''; seven of $\frac{1}{25}$—$\frac{1}{33}$'''; and thirteen of $\frac{1}{45}$—$\frac{1}{50}$'''; and found that without exception, or at all events in a very preponderating proportion, they were constituted of dark-bordered, finer and medium-sized, or even thick fibres; were whitish or white, and furnished with isolated larger or smaller ganglia. They are especially apparent on the inferior half and inner border of the organ, and appear to be all destined for the medullary substance, in which, at least in the Mammalia, an *extremely rich plexus* of dark-bordered, finer fibres occurs, inclosed in the *trabeculæ* and connective tissue, their terminations, however, being nowhere perceptible.

5. ii. Functions.—As regards the *functions* of the supra-renal glands, in the absence of all physiological indications, and so long as the course of the nerves in them is not more accurately known than at present, only very general observations can be offered. Kölliker *considers the cortical and medullary substances as physiologically distinct*, and that the former may, provisionally, be placed with the so-termed "blood-vascular glands," and a relation to secretion assigned to it; whilst the latter, on account of its extremely abundant supply of nerves, must be regarded as an apparatus appertaining to the *nervous system*, in which the cellular elements and the nervous plexus either exert the same reciprocal action as they do in the grey nerve-substance, or stand in a relation as yet wholly unascertained towards each other.

6. According to Leydig, the *cortical* substance of the supra-renal capsules of the Mammalia corresponds to the yellow, granular, and striped supra-renal bodies of fishes and amphibia; whilst the *medullary* substance of the mammalian organ, which is abundantly supplied with nerves and cells, very like the ganglion-globules, represents the other divisions of the sympathetic ganglia: whence he concludes that Bergmann's view, according to which the supra-renal capsules are closely related to the nervous system, is undoubtedly correct, and that those organs bear the same relation to the ganglia of the sympathetic nerves, as the pituitary body bears towards the brain. Besides this relation to the nervous system, however, they have an intimate one with the vascular; and are, therefore, always pervaded by a very close capillary plexus.

7. The functions of the supra-renal bodies have been *experimentally* investigated by Brown-Séquard, Harley, and others, but with different results. We know how uncertain these results are in the lower animals, and the amount of confidence which may be reposed in them, not only in those which were so frequently performed thirty and forty years since in order to determine the functions of distinct portions of the nervous system, but also in those more recently made with these and with other views. The former of the experimenters just named removed the supra-renal bodies from fifty-one rabbits, eleven adult cats and dogs, eleven young dogs and cats, eleven adult Guinea-pigs, four young Guinea-pigs, and two mice; and he states that the adult animals operated on died, on an average, in twelve hours, while the young or new-born animals lived thirty hours. From these experiments Dr. Brown-Séquard concludes that the supra-renal bodies are more necessary to life than even the kidneys; for animals will live two, or even three days, after the removal of the latter organs. Dr. Harley quotes from a later publication of Dr. Brown, in which the latter states that, of ten rabbits from which he extirpated the supra-renal capsules, six died, between the seventh and tenth hour, and four between the tenth and fourteenth hour after the operation, and adds, that the animals died too quickly to admit of their death being the result of peritonitis; and further, that the extirpation of these capsules is followed by symptoms which do not occur after injuries of the peritoneum or liver, &c., these symptoms indicating that the supra-renal bodies have an important influence on the blood, and that their nerves have a singular power upon certain parts of the central nervous system. He states that this latter influence manifests itself very distinctly in some cases after the extirpation or the puncture of one of these bodies, the animals being sometimes seized a few minutes before death by vertigo and rolling over. Dr. Brown-Séquard concludes, *first*, "that if these organs are not essential to life, they are at least of very great importance. Secondly, that their functions appear to be at least as important as that of the kidneys, for when they are absent, death in general supervenes more rapidly than after the removal of the kidneys." (*Archives Génér.* 1857, p. 374.)

8. Dr. Harley has published experiments which furnish different results from those now stated; and from those he infers, that "the supra-renal capsules are not absolutely essential to life;" that "the removal of the right, is generally more fatal than the removal of the left capsule;" that "convulsions do not necessarily follow the removal of the capsules;" that, "when death follows upon the extirpation of the supra-renal bodies, it is in most cases in consequence of the injury done to the neighbouring tissues; perhaps more frequently the mutilation of the ganglionic system of nerves;" that "absence of the function of the supra-renal bodies is not proved to have any special effect in arresting the transformation of hæmatin, or in increasing the formation of blood-crystals;" and that the suppression of the functions of these bodies is not attended by an increased deposit of pigment in the skin, or its appendages, in certain of the lower animals; the problem of the connection of bronzed skin and supra-renal capsular disease, being more likely to be solved in the dead-house than in the physiological laboratory.

9. Viewing the structure and connections of the supra-renal bodies as altogether similar to those of the pituitary gland, and considering these organs as very intimately connected, anatomically and functionally, with the ganglia and ganglial plexuses, I have been induced to view them as organs contributing or subsidiary to the organic nervous force or influence exerted by the ganglial nervous system. Thirty-four years ago I published this opinion of the function of the pituitary gland in my Physiological Notes, &c. (in 1824), and stated, that this gland reinforced the ganglial nervous influence endowing the brain by means of the ganglial nerves distributed to the cerebral organs—that it was a portion of the ganglial nervous system contributing to the nourishment and functions of the brain, *and imparting an unity of development, of permanent nutrition and of function, to the double organs composing the cerebral mass.* It appears very probable that similar offices are performed by the supra-renal bodies as regards the ganglia and ganglial plexuses of the abdomen; these bodies contributing to the functions of the organic nervous or ganglial system, as displayed by the abdominal organs — whether digestive, assimilative, or generative. That both the pituitary body and the supra-renal bodies perform these important functions — important not only as respects the performance of their respective functions, but also as regards the life of the individual—appears to be manifest from the nature and character of the nervous communications existing between them and other parts of the ganglial nervous system; for, instead of describing these communications merely as branches of nerves detached from other ganglia or parts, it would be more correct, taking the size and appearance of these branches into consideration, to describe them as branches sent from the medullary structure of these bodies, to those ganglia, plexuses, and nervous trunks, in order to convey to these the special influences or functions of these bodies; or, otherwise, to reinforce and combine the influence exerted by these several ganglia and parts, with which they are anatomically connected. That these bodies are of the greatest vital as well as functional importance is evinced not only by the consequences following their structural lesions, and by the presumed nature of their functions, but also by the manner and the positions of their lodgements; both the pituitary and the supra-renal bodies being so located as to render them, in their respective situations, further removed, and better protected from injury, and even from structural or other disease, than any other part of the animal organisation.

10. II. STRUCTURAL DISEASE OF THE SUPRA-RENAL BODIES. — *Lesions of the Supra-renal Bodies, and their Associations, &c.*

CLASSIF.—IV. CLASS. I. ORDER (*See Preface, &c.*).

11. DEFINIT. — *General languor and debility, anæmia, feebleness of the heart's action, remarkable irritability of the stomach, frequent vomiting, and pain in the back and loins, often with a bronzed or dusky hue of the general surface, rapidly increasing exhaustion, emaciation, &c.*

12. Disease of the supra-renal bodies usually commences so gradually as not to admit of the patient's knowledge of the exact period at which he first began to experience loss of health or strength. It is almost always gradual in its early progress, although often rapid in its more advanced course. The slowness or rapidity of its progress must, in the present state of our knowledge, be attributed to the nature and extent of the organic lesion, to the circumstance of one or both bodies being affected, and to the nature and severity, local or constitutional, of the malady with which structural change of these bodies is complicated.

13. i. *Symptoms.*—Generally the patient at first complains of weakness or more marked debility, of languor, and of indisposition to bodily and mental exertion. The appetite is impaired or lost; the pulse is soft, weak, and often frequent; the whites of the eyes are pearly; the body is sometimes more or less emaciated, or, if not emaciated, leuco-phlegmatic or cachectic, or discoloured, and generally anæmied. Uneasiness or pain, often severe, is referred to the region of the stomach, epigastrium, back, or loins. Nausea, sickness, retchings, and frequent vomitings often occur, especially as the prostration, anæmia, and discoloration of the skin advance. In some cases, complicated with disease of other organs, especially when such disease is acute or disorganising, the discoloration may either be absent or overlooked. In other cases, it is slight, or in patches, consisting of a murky hue; but, in others, it amounts to a bronzed tint, and is general over the whole surface, but is commonly most marked on the face, neck, superior extremities, penis, and scrotum, in the flexures of the axillæ and limbs, around the umbilicus, &c., varying in deepness from a dingy or smoky appearance to a chestnut-brown, or colour of a mulatto. In some cases, patches of a lighter hue occur in various parts; and in many the discolouring may be remarked in some of the internal surfaces, the peritoneum, pleura, &c.

14. With the continuance and progress of disease, the languor, anæmia, loss of appetite, and feebleness of the heart's action are aggravated. The discoloration of skin becomes in some cases more marked, the commissures of the lips much darker, the pulse smaller and weaker, vomiting more frequent and urgent, and pain and weakness of the back and loins more complained of. At last the patient sinks and expires, after a period which is very indefinite, so that the disease may appear almost acute in some instances, and more or less chronic in others, most probably owing either to the severity of the disorganising lesions affecting the supra-renal bodies, or to the nature of the complications characterising particular cases.

15. Although lesions of these bodies are often uncomplicated with disease of any other organ — although no lesion or disorder of any important or vital part can be detected, in many cases, during the life of the patient, lesions of these bodies, and a peculiar anæmia, being the only or chief lesions found after death, very frequently accompanied with discoloration — yet they are often associated with other diseases, chiefly of a constitutional and cachectic nature, more especially with general or partial tuberculosis, with cancer, and with disease of the lungs, &c.

16. The following *table of cases of disease of the Supra-renal Bodies* comprises nearly all those which have been published up to this time. It is constructed according to that published by Mr. HUTCHINSON; and to it I have added some recent cases.

No.	REFERENCES.	SEX AND AGE.	OCCUPATION.	PREVIOUS HEALTH, &C.	EARLY SYMPTOMS.	BRONZING OF SKIN.—ITS DEGREE OR ABSENCE.
1.	Dr. Addison's Work, p. 9.	Male, 33	Baker - -	No history. Skin white when in health.	Cough, followed by debility and bronzing of skin.	Colour of Mulatto; scrotum and penis darkest.
2.	*Ibid.* p. 12. -	Male, 35	Tidewaiter. Married. Exposed to weather.	Rheumatism eight years previously. Health generally good.	Acute attack of fever, followed by debility and bronzing of skin.	Dark olive-brown; also in lining of lips.
3.	*Ibid.* p. 15. -	Male, 26	Carpenter. Married. Intemperate.	Very good until three months before the change of colour.	Pain in the back and right leg, followed by debility, wasting, and giddiness.	Dark olive-brown, deepened in patches.
4.	*Ibid.* p. 19. -	Male, 22	Stonemason -	No history. Died soon after admission.	Pain in stomach; vomiting; tic douloureux.	Face, axillæ, and hands of bronzed colour.
5.	*Ibid.* p. 23. (From Dr. Bright's Reports.)	Female, adult.	Not stated -	No history - -	No history - - -	Complexion very dark -
6.	*Ibid.* p. 25. -	Male -	Barrister. Of middle age.	No history - -	No history - - -	Surface generally dark; face, neck, and arms covered with deep brown patches.
7.	*Ibid.* p. 30. -	Female, 60	Not stated -	No history. Cancer of supra-renal bodies; consecutive of cancer of breast.	Cancer of breast - -	Skin of arms, chest, and face of a light brown colour.
8.	*Ibid.* p. 32. -	Female, 53	A servant. Single.	Always thin; but of good health.	Cutaneous eruption four months previously; its cure being followed by stomach symptoms.	Skin generally very dark, with darker patches.
9.	*Ibid.* p. 35. -	Male, 53	Sailor. Married. Sober.	Very good. A strong muscular man.	Two months previously began to lose appetite and be generally unwell.	Face of a yellow bronzed tint, becoming still darker.
10.	*Ibid.* p. 38. -	Female, 28	Not stated -	Died of cancer uteri. Disease of supra-renal bodies being consecutive.	Those of cancer uteri -	A peculiar dingy appearance.
11.	*Ibid.* p. 39. -	Male, adult	Not stated -	Died of cancer of lungs, &c.	Those of cancer of the thorax.	Face of a dingy hue, with freckles and brown discoloured spots.
12.	Med. Times and Gaz., Dec. 15. 1855. (Dr. Burrows.)	Male, 24	Hawker, Single.	Had lumbar abscess in childhood.	Pain in the back, followed by emaciation and bronzing.	A dark copper or bronzed colour generally, and lighter patches.
13.	*Ibid.* Jan. 19. 1856. (Dr. Gull.)	Male, 24	Carpenter. Temperate.	Robust - -	Debility; breathlessness on exertion; nausea, &c.	Skin of a sallow olive-brown, darker on inside of lips, knees, &c.
14.	*Ibid.* Jan. 19. 1856. (Mr. Bakewell.)	Male, 28	Labourer -	Not known -	Not known - - -	Skin generally dark brown or bronzed, and darker over the thighs.
15.	*Ibid.* Feb. 20. 1856. (Dr. Thompson, &c.)	Male, 20	Baker. Sober	Good - -	Bronzing of skin - -	Skin of a general peculiar dark dirty-brown colour.
16.	*Ibid.* Feb. 23. 1856. (Dr. Rowe.)	Male, 20	Not stated -	Delicate - -	Delicate health and bronzing of skin.	Skin generally brown, with darker spots.
17.	*Ibid.* Mar. 8. 1856. (Dr. Farre.)	Male, 37	A publican. Intemperate.	A year before had pain in the lumbar regions, which subsided.	Admitted for delirium tremens.	Skin generally of a peculiar yellowish brown.
18.	Dr. Addison's Work, p. 29.	Male, 60	Not stated -	No history - -	No details - - -	Generally dark and bronzed, with blanched patches.
19.	Med. Times and Gaz., p. 233. (Dr. Stocker.)	Male, 56	Physician -	Dyspeptic, but not otherwise ill.	General malaise and irritability of stomach; increasing debility and emaciation.	Patches of brown colour which extended; small patches on the face.

GENERAL SYMPTOMS, COMPLICATIONS, &C.	DURATION OF DISEASE.	MODE OF DEATH.	INSPECTION AFTER DEATH.	REMARKS.
Excessive debility; emaciation; demeanour puerile; urine healthy; pain in lumbar region; cough; soreness at the epigastrium.	3 years	Acute pericarditis and pneumonia.	Supra-renal bodies both remarkably indurated and as large as eggs, and quite disorganised; recent pericarditis and pneumonia; no tubercles, nor other visceral disease.	A well-marked case. No chronic lesions but those of supra-renal bodies.
Pinched anxious expression; vomiting; pulse very feeble; depression; constipation; tenderness at epigastrium; numbness of extremities.	6 months	Not stated	Both supra-renal bodies contained compact fibrous concretions; gastric mucous surface inflamed; no tubercles; no other visceral disease.	The deposits in supra-renal bodies resembled tubercle, but there was no tubercle in other organs.
Thin, pale, and feeble; fainting on rising from bed; sickness and hiccup; pain in back; ang. curvature of spine; leucothymia, &c.	7 months	Passed into a torpid state.	Supra-renal bodies completely destroyed and converted into strumous deposits; psoas abscess and caries of lumbar vertebræ; tubercles in lungs; spleen enlarged.	The blood, both before and after death, contained a great excess of white corpuscles.
Vomiting and pain in stomach; great debility; emaciation; extreme prostration, &c.	Several months.	From collapse and sinking.	Supra-renal bodies wasted and destroyed, both weighing only 49 grains. No other disease.	The disease of supra-renal bodies was an atrophy; probably consequent on inflammation.
Extreme debility; vomitings; emaciation; abscess in breast. &c.	Not stated	Slight wandering, gradual sinking and drowsiness.	Both supra renal bodies were enlarged, lobulated, and the seat of tubercular-like deposits, both four times the natural size; the left had suppurated.	This case was recorded by Dr. Bright before the importance of dissection of supra-renal bodies was recognised
Slight emaciation; great anæmia; extreme languor; urgent vomiting; pulse very compressible.	1 year	Speedy sinking	Both supra-renal bodies greatly enlarged, of irregular surface, and much indurated; natural structure lost; nucleated cells. No other important disease.	Vomiting had been so urgent in this case as to suggest the existence of malignant disease of the stomach.
No history. Died of ulcerated cancer, the bronzing being remarked at the post-mortem inspection.	Not stated	Not stated	Both supra-renal bodies contained much cancerous deposit; throughout their structure.	
Emaciated and feeble; much irritability of stomach.	4 months	Died of exhaustion in three days after admission.	Cancer of pylorus; left supra-renal body destroyed by cancer.	The extent of discoloration of skin was proportioned to that of disease of supra-renal body, one being sound.
Sickness, without vomiting; weakness and loss of appetite; frequent rigors; no pain; pulse 80, feeble; body irritable.	3 months	Sunk gradually	Tubercular deposit in one supra-renal body; in the spleen also; and the kidneys were degenerate.	The degree of bronzing appears to have been proportioned to that of disease of supra-renal body, one only being affected.
Discoloration of skin not noticed until the post-mortem inspection, when disease of supra-renal body was foretold. No history preserved.	Not stated	Died from cancer	Right supra-renal body healthy; the vein emerging from the left obstructed by cancerous deposit; and the organ itself occupied by recent extravasation of blood.	The degree of bronzing was slight; the disease of one supra-renal body being recent.
No history preserved	Not stated	Died of cancer	One supra-renal body entirely disorganised by cancer; the other healthy.	One supra-renal body was affected, and the bronzing was slight.
Irritability of stomach, with vomiting; pain across the back; great debility; emaciation; urine natural, &c.	8 months	Died from exhaustion consequent upon a purgative.	Both supra-renal bodies contained pus and bodies resembling hardened tubercle. There was no other disease.	The chain of morbid phenomena was very complete in this case.
Nausea; vomiting; great malaise; exhaustion; emaciation; urine healthy; blood loaded with white corpuscles.	5 months	Sudden exhaustion	Both supra-renal bodies atrophied and destroyed; the left contained cysts, the right solid concretions.	
Weak and low for a long time; not much emaciation.	Unknown	From exhaustion caused by a short journey.	Both supra-renal bodies completely atrophied, and contained calcareous concretions; emphysema of lungs; fatty degeneration of heart.	
Suddenly languid, and afterwards collapsed, and died after three days; tint of skin observed for six weeks.	6 weeks	Collapse	Each supra-renal body enlarged to the size of half a kidney; their structure converted into a firm tubercular-like matter, and in parts softened.	This appears to have been idiopathic disease of supra-renal bodies, no tubercles being found in other organs.
Had also disease of knee-joint, and health rather improved until within three days of death. He remained fat and muscular.	8 months	Diarrhœa, followed by succession of epileptic fits, vomitings, &c.; died on fourth day of these.	Both supra-renal bodies destroyed, containing gritty, cheesy, and semi-purulent deposit. No other disease.	In this, as in case 23, a peculiar disagreeable odour exhaled from the patient for three or four weeks before death.
He died in a fortnight from delirium tremens.	3 weeks or more.	Sunk into a typhoid state, with low delirium.	Both supra-renal bodies were converted into abscesses, but their cortical substance was not wholly destroyed; circumscribed abscess in the liver.	In this case the suppuration and inflammation of supra-renal bodies had probably been acute and recent.
Anæmic; heart's action very feeble; irritability of stomach; œdema of upper extremities.	Not stated	Died of debility; cancer in mediastinum suspected.	No inspection	The cachexia was precisely that of diseased supra-renal bodies.
Great debility and wasting; but no organic disease but that of supra-renal bodies indicated.	About 6 months.	From exhaustion	No inspection	The bronzed patches indicated the patient's speedy death when there were not other alarming symptoms.

No.	References.	Sex and Age.	Occupation.	Previous Health, &c.	Early Symptoms.	Bronzing of Skin.—Its Degree or Absence.
20.	*Ibid.* Dec. 15. 1855. (Mr. Startin.)	Male, 12	At school. (Irish.)	Had suffered from abscesses in the neck, and cough.	Loss of appetite, flesh; increasing languor and debility.	Copper-colour general, and deepest on the face and neck.
21.	*Ibid.* Dec. 29. 1855. (Dr. Peacock.)	Female, 14	At school	Healthy	Lassitude; muddy complexion; and slight cough.	A brown muddy tint, deepest on face, arm, and shoulders; no mottling.
22.	*Ibid.* Jan. 19. 1856. (Dr. Burrows.)	Female, 28	Married. Temperate.	Delicate	Menorrhagia and debility two years before the discolouration.	A fawny or yellowish-brown tint; most marked on face, arms, thighs, and legs; patchy discoloration in parts.
23.	*Ibid.* Feb. 23. 1856. (Dr. Rowe.)	Male, 45	A carter. Married. Temperate.	Robust	Dark spots in various regions of body. At first no illness.	Skin dusky-brown, resembling that of a mulatto; darker in some parts than in others.
24.	The Associ. Jour. Jan. 19. 1856. (Dr. Budd.)	Female, 42	Married	Good	A brown tinge of skin, followed by typoid fever; after which bronzing became more marked.	Skin like that of a North American Indian; certain parts darker than others.
25.	*Ibid.* Jan. 19. 1856. (Dr. Budd.)	Female, 40	Not stated	Not stated	Not stated	Very dark general discoloration; large patches in mouth.
26.	Med. Times and Gaz., Feb. 23. 1856. (Dr. Thompson.)	Male, 33	Married	Good	Paroxysmal pain in the abdomen; loss of strength; amenorrhœa.	Skin became suddenly and generally of a dirty-brown tinge.
27.	*Ibid.* Dec. 22. 1855. (Dr. Rankin.)	Female, 56	Married	Formerly very stout and of large frame.	Loss of strength and flesh	Face and hands dark brown — "as brown as a Japanese;" other parts not seen.
28	Trans. of Path. Soc., vol. viii. p. 325. (Dr. Baly.)	Male, 18	Baker	Headache; pains in the limbs; languor and debility; followed by pain in the loins.	As stated; with bronzing of the skin; pain increased by pressure on the loins; vomiting, &c.	Bronzing deep and general
29.	*Ibid.* vol. viii. p. 330. (Dr. Baly.)	Not stated	Not stated	Diseased vertebral column.	Not stated	No bronzing of the skin
30.	*Ibid.* vol. viii. p. 330. (Dr. J. Ogle.)	Female, 14	Not stated	Incontinence of urine, scalding, containing blood and pus.	Consequent on the urinary disorder; symptoms of phthisis, under which she sunk.	No bronzing of the skin
31.	*Ibid.* vol. viii. p. 332. (Dr. J. Ogle.)	Male, 36	Not stated	Emaciation, &c.	Symptoms of phthisis	No bronzing of the skin
32.	*Ibid.* vol. viii. p. 333. (Drs. Peacock and Bristowe.)	Female, 18	A tent-maker	Had a fall, and severe pain in the right side.	Fever, with pains in the lower extremities; œdema, &c.	No bronzing of the skin
33.	*Ibid.* vol. viii. p. 337. (Drs. Peacock and Bristowe.)	Male, 55	Coppersmith	Good	Declined in flesh and strength; pains in back and limbs.	No discoloration of the skin.
34.	Med. Times and Gaz., Nov. 21. 1857. (Mr. Wilks.)	Female, 18	Young lady	Delicate, but of full habit.	General debility and chronic rheumatism; lassitude and sickness.	A deep bronze tint of skin.

17. Mr. Hutchinson has collected a number of the cases which have been recorded, and has given a view of the chief symptoms which have characterised them. I shall notice these symptoms briefly and in succession, but independently of his account of them. — 1st. *Bronzing of the skin* was observed in the majority of cases of structural lesion of the supra-renal capsules, recorded by Dr. Addison and some others, and this physician was inclined to believe that this symptom was indicative of such lesion. Several cases have more recently been observed where lesions of these capsules have been found without this change of the colour of the skin, and without any change whatever. Several such instances are recorded in the 8th vol. of the Transactions of the Pathological Society. — 2d. *Great debility*, without any evidence of thoracic or organic disease, loss of mental energy, faintness, exhaustion, &c., were very general symptoms. — 3d. *Irritability of stomach*, nausea, occasional or frequent vomitings, were also prominently observed. — 4th. *Pain* in the epigastrium, back, and loins, sometimes acute, in some instances dull, or an aching merely, was general. — 5th. *Anæmia* was, also, generally present, this fluid being impoverished and abounding

GENERAL SYMPTOMS, COMPLICATIONS, &C.	DURATION OF DISEASE.	MODE OF DEATH.	INSPECTION AFTER DEATH.	REMARKS.
Some emaciation; great and increasing debility; oppressed aspect; urine healthy.	9 months	Sunk from diarrhœa; a succession of convulsions just before death.	No autopsy - - - -	Gradually increasing prostration for four months.
Countenance expressive of great languor; emaciation; marked debility; liability to faintings, &c.	18 months	Suddenly, from an epileptic fit.	A chalky concretion found in the medulla oblongata. The supra-renal bodies said to be free from disease.	
Appetite very bad; thirst; great debility; pain in the loins; menorrhagia; anxious expression.	7 months	Not known - -	No inspection.	
No material loss of health until within a few weeks of death; debility; loss of appetite; irritability of stomach supervened; failure of memory for some months; urine normal.	3 years -	From incessant vomitings; delirious before death.	The chief lesion observed was tubercles in the lungs. The supra-renal bodies were not examined.	A peculiar and disgusting odour a few days before death.—See case 16.
About eight months after the first bronzing she began to lose flesh and strength; harassing cough; irritability of stomach; extreme anæmia; and debility supervened.	16 months	Sank gradually from exhaustion.	No autopsy - - - -	Eight months after the change of colour began the patient had a fine healthy infant.
Anæmia and extremely feeble; sickness and vomiting.	Not stated	Gradually sank from exhaustion.	No autopsy - - - -	This case very closely resembled the preceding one.
Anæmic and feeble, followed by discoloration of skin, and by a peculiar collapse.	5 weeks -	Recovered under the use of tonics: the skin becoming simply pallid.	Recovered - - - -	Inflammatory disease of supra-renal bodies may be conjectured.
Sinking at pit of stomach; nausea; loss of appetite, strength, &c.; secretions healthy; heart's action very feeble.	Not stated	Still living - -	Living at time of Report - -	The symptoms combine to indicate disease of supra-renal bodies.
Fever; small, feeble, and quick pulse; severe pain in loins, increased by pressure; frequent vomiting; tendency to diarrhœa; abdomen flat, empty, and tender; urine albuminous; peculiar odour of skin.	12 months	Exhaustion; stupor; unconsciousness.	Both supra-renal bodies atrophied, and their entire structure destroyed. History and inspection fully given, with a plate.	The case very chronic, well-marked, and the supra-renal bodies most completely disorganised. A very interesting case.
Disease of the vertebral column, apparently causing death.	Not stated	Not stated - -	Both supra-renal bodies contained nodules of firm substance, grey and semi-transparent externally, and yellow and opaque internally. A great part of their proper structure unaltered.	Apparently an earlier stage of the lesions observed in case No. 28.
Phthisis; under which she sunk -	Not stated	Died from scrofulous deposits, and vomicæ in lungs.	Extensive deposits of crude tubercular matter in both supra-renal bodies, and in the lungs and left kidney.	No symptoms but those of phthisis mentioned.
Hectic and symptoms of phthisis	Not stated	Died from phthisis	Extensive deposit of scrofulous matter in one supra-renal body; the other not affected.	No symptoms excepting those of phthisis mentioned.
Tumour in left side of abdomen; emaciation; prostration; liver enlarged; the spine very prominent at the last dorsal vertebra, &c.	3 months	Exhaustion -	Cancer of both supra-renal bodies, and cancerous deposits in both kidneys and in other parts.	History, case, and of the diseased appearance full and interesting.
Emaciation; care-worn countenance; retraction of gums, loss of teeth, sordes on the gums, &c.; general want of power; pains in the loins, &c.; anæmia.	4 months	Exhaustion -	Supra-renal bodies both destroyed, their substance being replaced by a soft white encephaloid deposit; similar deposits in the lungs.	History and morbid appearances fully detailed.
Sickness; feeble pulse; fits of incessant vomiting, returning after short intervals, for seven weeks; emaciation.	12 months or more.	Exhaustion -	Both supra-renal bodies enlarged, inflamed, and contained purulent matter, with gritty matter in the right.	No other visceral disease observed.

with white corpuscles, the soft solids being flabby.—6th. *Feebleness of the heart's action*, a soft, compressible, feeble, and more rarely a quick pulse were usually observed. — 7th. *A cachectic, leuco-phlegmatic, and unhealthy* appearance of the body, with or without emaciation, were frequently remarked. —8th. *A disagreeable and peculiar odour* was exhaled from the body, in some cases, during life; and — 9th. *Several nervous and convulsive symptoms* were observed in a few instances. The tongue, the bowels, and the urine, did not present much indication of disorder. *Death* appeared to result chiefly from vital depression or exhaustion, with more or less indications of alteration of the circulating fluids. In some cases, death was attributable to the disease with which the lesion of the supra-renal bodies was complicated, as to cancer, tubercular disease of the lungs, &c. The circumstance of one of those bodies only being diseased, and the extent to which the structure of one or both had been destroyed, may be viewed as modifying or altogether altering the symptoms and the final issue.

18. ii. *The chief lesions of these bodies* which have been recorded are the following: — (*a*) Appearances of acute inflammation and its con-

sequences, suppuration, &c. — (*b*) Atrophy and total disorganisation of their structure — (*c*) Calcareous depositions, or fibro-calcareous concretions, with or without cysts, some of which contained a fluid puriform matter. — (*d*) A fibrous degeneration, with great enlargement and induration. — (*e*) Tubercular deposits, with great enlargement and loss of the healthy structure of these bodies — (*f*) Deposits of cancerous matter, consecutively of cancer in other organs, more or less of the normal structure of these bodies being still preserved. Although these structural lesions were more frequently observed in both supra-renal bodies, yet one only was not infrequently affected, and in a few cases a portion of the healthy structure of the diseased body was preserved. The disease of one body only, or the preservation of a portion of the structure of the organ, may rationally be allowed to modify or more manifestly alter the resulting phenomena.

19. The *Diagnosis* of disease of the supra-renal bodies is very difficult: — 1st, As respects the certainty with which this disease may be inferred from the symptoms present — of which, bronzing of the skin, the persistence of retchings and vomitings, the anæmia, and the weakness and smallness of the pulse, are the most characteristic; — and 2d, As regards ascertaining during life whether or no the existing discoloration is to be imputed to disease of these bodies, or to one or other of the forms of JAUNDICE, which I have described as *Green*, and as *Cachectic*, or *spurious*, *Jaundice*. (See §§ 46—57.) In the histories of cases of disease of the supra-renal bodies which I have perused, no such diagnosis has been made or suggested; and the appearances of the stools and the states of the biliary and urinary excretions during life, and even of the biliary apparatus after death, have been either insufficiently investigated, or entirely overlooked.

20. The *Prognosis* is most unfavourable, as it does not appear that any case has recovered where the skin had become bronzed or much discoloured. The prognosis may therefore be ranked in the same category as the green form of JAUNDICE described in that article. (See §§ 46. *et seq.*)

21. The *Treatment* should be directed according to general principles, conformably with the phenomena and with the complications characterising individual cases. These will suggest the rational indications, and the means by which they are most likely to be fulfilled, as far as this may be possible.

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